YLEM
Artists Using Science and Technology
Journal

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BIG THINKERS: Is the Singularity near?

Unfinished Angel
Acrylic on canvas painting by Martha Senger now hanging in the lobby of the G2 arts complex in San Francisco, it was Senger's last work on canvas before she opted out of painting for the 'Neo-Vorticist' praxis she describes in this issue. Earlier she'd described it in a poem thusly:

in the 70's I was still painting
on my canvas a lopsided angel with only one wing
but also no frame in hopes a second might sprout
if the edge were left open
to such a possiblity

i was thinking of adding neon
some visceral extension that would reconnect the realms of life & art
let the forms of wholeness flow into our fragmented world
a new performance principle to bridge the abyss
between presence and absence/heaven and earth
a superconductive medium
or electric act perhaps

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Big Thinkers

I got the idea for this special double issue of the YLEM Journal when I attended the Stanford Singularity Summit. This was a massive free event which featured such eminent speakers as Ray Kurzweil, Sebastian Thron, who just won two million dollars for Stanford with his driverless car, and Erik Drexler and Christine Petersen of the Foresight Institute, experts on nanotechnology. Sitting next to Kurzweil, and following him in speaker order, was Douglas Hofstadter, the legendary author of *Godel, Escher, Bach*. Whereas Kurzweil's talk had included logarithmic charts and ponderous predictions, Hofstadter showed a series of handcrafted cartoons that twitted Kurzweil and a prominent West Coast philosopher, John Searle.

In the course of his talk, Hofstadter deviated from the main thrust of his argument to point out in an aside that David Cope's computer-generated program AMI did a poor job of imitating the styles of composers such as Bach and Mozart. I was surprised and piqued by this, since, I had scheduled an interview with Cope, whom I had first interviewed in the Seventies. So I gave Hofstadter a copy of the YLEM Journal and got his email address. I emailed him asking for an amplification of his remarks on Cope, which he sent me, and in our exchange I got permission to reprint his cartoons. I also got permission to reprint interviews with Ray Kurzweil, John Searle, and Jaron Lanier. Jaron and I tried to set up a new interview, but his wife's incipient delivery of their first child interfered with our scheduling. Martha Senger, an old friend, and Suzi Gablik graciously contributed new pieces for this issue of the YLEM Journal.

Most of the material in this issue deals to some extent with the concept of the Technological Singularity. This concept postulates that at some point in this century, machine intelligence will outstrip human intelligence. The concept was first articulated in the pages of the YLEM Journal in science fiction writer/physics professor Vernor Vinge's article, "Nature, Bloody in Tooth and Claw?" in the Jan-Feb 2003 issue, Vol. 23, #2. Vinge elaborated on his conception in my interview with him in the March-April 2003 issue, Vol. 23 #4, and the concept was also discussed by Bruce Sterling and William Gibson in that issue.

In this issue, Ray Kurzweil is the principle proponent of a positive attitude toward the Singularity, while Jaron Lanier weighs in against it. And John Searle elaborates on his famous "Chinese Room" argument, which since he enunciated it in the 1980 article "Minds, Brains, and Programs" in the Behavioral and Brain Sciences magazine, has emerged as one of the most notorious attacks on the concept of "strong Artificial Intelligence", the postulate that computers will at some point be able to emulate consciousness. I first met Searle at a conference on Psychology and Technology in Berkeley, CA, and he spoke plainly, "We can't make computers conscious, because we don't know what consciousness is."

The Chinese Room argument, as described by the Internet Encyclopedia of Philosophy, asks you to imagine yourself a monolingual English speaker "locked in a room, and given a large batch of Chinese writing" plus "a second batch of Chinese script" and "a set of rules" in English "for correlating the second batch with the first batch." The rules "correlate one set of formal symbols with another set of formal symbols"; "formal" (or "syntactic") meaning you "can identify the symbols entirely by their shapes." You "get so good at following the instructions" that "from the point of view of someone outside the room" your responses are "absolutely indistinguishable from those of Chinese speakers." Just by looking at your answers, nobody can tell you "don't speak a word of Chinese."

I brought up Searle's argument to Rudy Rucker when I interviewed him for the YLEM Journal, Vol. 25, #10-12. You can read his comments at <www.ylem.org>.

My own point of view about the Singularity is that it would probably be wonderful and terrible at the same time, like emails and spam. Currently intellectuals can be divided into two camps, the anti-technologists who believe that civilization is in decline, and the pro-technologists who believe that this is the best time of all to be alive. I tend to postulate a time somewhere in the past where there was a state of equilibrium, and since then things have gotten better and worse in steady increments, with the gap between them widening, like a crescendo in musical notation. At some point, of course, the gap between the best of times and the worst of times reaches maximum deviation, and then a decrescendo begins, sliding toward an eventual equilibrium at some point in the far future, if we don't self-destruct before that.

I recently attended the World Science Fiction Convention in Anaheim, CA, and heard mention of the Singularity at many of the panels. At one panel, the writer John Barnes said he was standing with Vernor Vinge when somebody came over and expressed how wrong he thought Kurzweil was about the Singularity. When he left, Vinge said, "Thank God for Ray. He takes the heat for all of us."

Ray Kurzweil is the founder and chairman of Kurzweil Applied Intelligence. He was the principal developer of the first print-to-speech reading machine for the blind and other significant advances in artificial intelligence technology. He is the Editor of *The Age of Intelligent Machines* (1990), and the author of *The Age of Spiritual Machines: When Computers Exceed Human Intelligence* (1999), *Fantastic Voyage: Live Long Enough to Live Forever with Terry Grossman* (2004), and *The Singularity Is Near: When Humans Transcend Biology* (2005). His web page is <www.kurzweilai.net>.

Sander Olson is one of the original developers of the NanoApex and NanoMagazine web sites. Over the years, he has conducted numerous interviews with notable figures working in or commenting on the field of nanotechnology.

John Searle is Mills Professor Philosophy at the University of California, Berkeley. He is author of numerous books on the philosophy of language and the philosophy of mind, including *The Campus War* (1972), *Intentionality: An Essay In the Philosophy of Mind* (1983), *The Rediscovery of the Mind (Representation and Mind)* (1992), *The Construction of Social Reality* (1997), *Mind, Language, and Society: Philosophy In the Real World* (2000), and *Freedom and Neurobiology: Reflections on Free Will, Language, and Political Power* (2006). His web page is <socrates.berkeley.edu/~jsearle>.

Douglas Hofstadter is College of Arts and Sciences Professor of Cognitive Science at Indiana University, where he and his graduate students develop computational models of analogy-making, high-level perception, and creativity. He is the author of Gödel, Escher, Bach: an Eternal Golden Braid (1979), winner of the 1980 Pulitzer Prize, in which was stated Hofstadter's law: "It always takes longer than you expect, even when you take into account Hofstadter's Law." He co-edited The Mind's I: Fantasies and Reflections on Self and Soul with Daniel Dennett (1981). His book I Am a Strange Loop is forthcoming in 2007. His web page is <www.cogs.indiana.edu/people/homepages/hofstadter.html>.

Jaron Lanier is a computer scientist, composer, visual artist, and author. He coined the term 'Virtual Reality' and in the early 1980s founded VPL Research, the first company to sell VR products. He currently lives in Berkeley, CA, and is associated with the International Computer Science Institute (Berkeley, CA). He is a pianist and a specialist in unusual musical instruments. Lanier has performed with artists as diverse as Philip Glass, Ornette Coleman, George Clinton, Vernon Reid, Terry Riley, Duncan Sheik, Pauline Oliveros, and Stanley Jordan. His web page is <www.well.com/~jaron/>.

Alex Steffen has written or commented for the *New York Times*, *USA Today*, the *LA Times*, the *Wall Street Journal*, the *San Francisco Chronicle*, the *Seattle Times* and the *Seattle Post-Intelligencer*, *Seattle Weekly*, *Fast Company*, *Red Herring*, *Blue: the Magazine of Adventure Travel*, NPR's *All Things Considered and Morning Edition, Marketplace*.

Suzi Gablik is an art critic, curator, artist, writer, and teacher. She is the author of *Magritte*, (1976), *Has Modernism Failed?* (1985), *Reenchantment of Art* (1992), *Conversations Before the End of Time* (1997), and *Living the Magical Life: an Oracular Adventure*, (2002). Gablik has written that after completing *Has Modernism Failed*, "What I was moving toward was a new interpretation of the relationship between artist and society, based on a sense of ethical responsibility towards the social and environmental communities. What was in the air was a new set of values, concerned with 'right' living in an interconnected universe."

James Marriott wrote The Next Gulf (2005) with Andrew Rowell and Lorne Stockman. As Suzi Gablik puts it, the book "is about the oil war happening now in the Niger Delta."

Martha Senger is an artist, poet, philosopher, cultural theorist, social activist, and writer. She is founding director of the G2 Institute for Integral Aesthetics and producer of its 'Aesthetic Phase Shift' lecture series, which has presented such seminal thinkers as Ralph Abraham, Idriss Ackamoor, Susan Alexjander, Suzi Gablik, Rhodessa Jones, and Dr. Salvatore Santoli. Earlier, Martha was Executive Director of the Artspace Development Corporation (Artsdeco) that developed the G2 live/work arts complex on San Francisco's Potrero Hill. You can check out Martha's article on G2's unique toroidal topology at <www.g2institute.org>.

Martha and I are neighbors on the Yellow Ferry Harbor dock in Sausalito, CA.

-Loren Means, Editor

In this Issue:

Announcements

The YLEM Journal offers its condolences to Trudy Myrrh Reagan at the passing of her mother.

Helen Carter King, a long-time benefactor of the YLEM community.

Helen Carter King was a woman of many talents, and full of curiosity, compassion and imagination. Raised in Washington, DC, and coming of age in the Roaring Twenties, she was active in the arts scene and had many adventures first with a WW I pilot, and then with a man who helped set up the OSS (later CIA). She played violin, wrote poetry, and appeared in theatrical productions.

In 1932, she married a geologist with the U.S. Geological Survey, Philip B. King, and followed him to remote areas where he was doing field work, principally in an area of West Texas and in the Great Smoky Mountains in Tennessee.

Daughter Gertrude (Trudy) was born in 1936. In 1951, with the help of a partial scholarship and by dint of much hard work, they were able to send Trudy to Westtown School, a Quaker boarding school near Philadelphia, for college preparation.

In 1954, the family moved West, Trudy to attend Stanford, and Philip to a temporary teaching position at UCLA. He finished his career at the USGS in Menlo Park and became well-known for his geologic map of North America.

Through all the moves, Helen engaged herself in arts activities and community work, especially with schools and libraries, wherever she found herself.

In Los Altos, she became active once again as a poet, earning many prizes in her later years. She was awarded an honorary doctorate from the University of Warsaw, which she treasured, having been unable to attend college. One of her projects was to help several young people to attend. She gave generously to small poetry publications, and arts groups like YLEM, which was started by her daughter, Trudy Myrrh. She helped found the Los Altos Public Library. Young people and seniors benefited from her informal poetry and art classes, and she opened her home to evening seminars in oriental studies. Painting became her passion as well. She walked everywhere, because she didn't drive.

In her last years, she made conversation her art form, regaling family and friends with tales of her rich past. She died quietly in her home June 14, 2006, surrounded by family, friends, and her beloved care giver, Adi Laisa Rodgers.

YLEM turns 25!

A note from our Founder

YLEM's president, Torrey Nommesen, reminded me that it was May 5th, 1981 when we held our first Forum, at Fort Mason in San Francisco. On the program were:

Dale Seymour, who started Creative Publications, speaking about visual math;

Carrie Adell, goldsmith, showing jewelry based on science photos, like the sun's corona;

Walter Zawojski, staff artist at SLAC, showing airbrush paintings resembling polarized crystals;

Nelson Judah, designer, on the design of playgrounds;

Ruth Asawa, noted San Francisco sculptor;

Robert Ishi, head book designer for W.H. Freeman attended. Asawa and Ishi were our first dues-paying members.

Twenty-five years! If YLEM were a tree, it would tower well above my house by now. People who know me know that I am not much of a tool user or scientist, just fascinated with people who are. I have been privileged to promote artists as they latched on to each new development as it came down the pike: personal computers, programming skills, graphics software, robotics, interactive multimedia, the internet and tech art on the Black Rock Playa. As well, their work and mine touched subjects like visual math, microbiology, brain research and cosmology. YLEM has not only influenced this new scene by encouraging these artists, but YLEM has imprinted itself on the lives of each of us. The friendships and collaborations we have created are amazing! I am profoundly grateful for all who have helped keep this fluid, informal organization going.

-Trudy Myrrh Reagan,
founder, YLEM and program director

Of Tipping Points and Sinking Ships:
A Conversation between James Marriott and Suzi Gablik

Gablik at the Aesthetic Phase Shift Lecture Series

[This conversation took place in Blacksburg, VA on April 16, 2006. James was visiting from England. It was his birthday, and he wanted to do this as a birthday present.]

JM: Can we talk more about that line you wrote the other day, which was "What do we do when perfume has no future, and the ship is sinking?" What exactly did you mean by that?

SG: It really does seem like that is the $64,000 question, but I am not the first one to ask it. James Hillman and Michael Ventura first asked what we should be doing when the ship is going down, in their book *We've Had a Hundred Years of Psychotherapy – and the World's Getting Worse*; and indeed, the world has got steadily worse ever since then. I only threw in the part about perfume to show my solidarity, because, as far as I am concerned, I can't think of a more pressing question. It's something I think about all the time, although I've never found any ultimate answer. Our present circumstances seem to have taken us to a whole new context for living that the human race has never had to confront before, so it's difficult to refer to any historical precedents or even to one's own personal experience to know what to do. One thing that keeps coming to mind is the image of Sir Ernest Shackleton and his crew of 272 men, who really did lose their ship on an expedition to the Antarctic in 1914, and were stranded, helpless and isolated from the world for nearly two years, on an ice floe. They lived through two sunless, totally dark Arctic winters, and survived by hunting seal and penguins, never sure if they would be rescued or not. I see this as a kind of symbolic metaphor of things to come for the human race. We are like sailors who have lost our ship. For the first time, our future is uncertain.

JM: We were also talking yesterday about the significance of beauty – what do you think about the role of beauty is these dire times?

SG: I think beauty is intrinsic to life on earth, as many other things are also intrinsic to life on earth. One of our problems is that we have not learned to honor this intrinsicality. As humans, we are in constant violation of the value of things in and for themselves – including beauty – things that are vital to existence. In our refusal to give adequate meaning and value to intrinsic things, we are ruining life for ourselves (pace Chief Seattle).

JM: It's true. It seems to me that the ways to address the challenges we're talking about are very different to how we've been doing things in the modern era. The archetype for addressing big changes in the modern era has been revolution, which implies sacrifice now for rewards later, so we go through the blood of a revolution in order to arrive at some future Utopia.

SG: I'd probably frame the archetype of the modern age as: whatever problems we have, science and technology will find a solution and fix it, and we have yet to really get it that, much like revolution, this doesn't work either. We haven't invented any kind of technology that can bring back to life all that technology so insidiously destroys.

JM: I agree. To my mind, the theology of science and technology is much the same in its structure as revolution. The basic belief is that there's always a better future around the corner. The whole structure is, you could say, one of delayed Nirvana. The more I look at it, the more that approach seems completely flawed.

SG: The notion of delayed Nirvana may be nothing more than a pretext for accepting our sins in the present – getting away with doing what we want to do when we want to do it. Our culture thrives on it.

JM: Yes, that's a core understanding I've gleaned from critiquing corporate culture. The manner in which companies run themselves has a kind of engineer's mentality that assumes everything can be solved by technology. You make a mess in terms of oil spillage, but you can clean it up. You pollute the atmosphere with toxic chemicals, but you can fix it. If you look at corporate literature, especially the in-house magazines for the staff, they're constantly focusing on this kind of crazed fiction.

SG: Don't you think the world has run up against the outer limits of that?

JM: Absolutely! But what is so sad is that so many people want to believe it's true, because it gets them through the day more easily. Just look at the studies our group [PLATFORM, an arts collaborative] has done on the oil wars in Nigeria. We read Shell's sustainability reports; they will address pollution by saying, we've done very bad things, we admit it, but here is the good thing we're going to be doing, so we'll sort it out. Year after year, you see the same statements, but the same problems keep re-occurring – and have been for fifty years. So there's this constant delayed Nirvana, like I said.

Announcements continued

Forums

For upcoming forums and details on the forums below, please visit our site at <www.ylem.org/Forum/>. Forums are usually held on the second Wednesday of odd numbered months in San Francisco.

"What's Hidden in the Molecules?"
Wednesday, May 10, 8 pm
RX Gallery and Bar, SF, CA

Few recent discoveries have the power to inflame our imagination as much as Luca Cavalli-Sforza's work tracing how humans fanned out from a small area of Africa to cover the globe. Tracing both DNA markers and linguistic studies, his lecture will draw a picture for us of human migrations since the very earliest times, which yields many surprises.

Julian Voss-Andreae, a German-born artist originally trained in quantum physics, will present his current sculptures inspired by proteins, the beautiful and bizarre building blocks of life. His sculptures where recently featured in journals such as "*Leonardo*" and "*Science Magazine*".

YLEM Forum: "Biomimicry"
Wednesday, July 19, 8 pm
RX Gallery and Bar, SF, CA

Biomimicry, a term first coined in 1997 by biologist Janine Benyus, is a term that applies to many inventive new industries. It is the art and science of learning and using the "designs" which we see all around us, about copying what Nature seems to do very well. Think spider silk stronger than steel! What is important for a world rapidly depleting its resources, Biomimicry is about using nature's "manufacturing ideas" to be more efficient with materials and energy. An engineer, Onno Koelman of Pax Scientific, and a teacher of product design, Sue Redding of CCA, present some elegantly practical applications of Biomimicry.

SG: It can hardly be called Nirvana when you restore something you've destroyed back to the state it was in before you destroyed it.

These days we're pretty far from Nirvana, and we're losing even more ground as we speak. However, I think we need to have some compassion for the human plight – for the fact that we aren't doing better than we are. How can we condemn others – the people in corporations, for instance, who claim they will fix things up afterwards – when the truth is that none of us, including you and I, really knows how to save the ship. Things may just not be fixable.

JM: Yes, I agree that there's a worthwhile function in trying to find some kind of narrative to help us deal with this possibility. I certainly agree with the premise that our current problems may not be solvable. Let's take the example of the Polar ice caps melting. This is what makes climate change very different from other environmental issues, I think. If you take other classic cases of environmental struggles, such as the one over DDT in the 1960s, we could, in a sense, win that. We could address the question of whales being made extinct by not hunting them. But we can't keep New Orleans from being flooded. Climate change seems like it is something completely different, intractable, in a class by itself. It creates a challenge to cope with something which may, in fact, be unsolvable. What can we do in the face of something that's unsolvable? This is very difficult, I think, for our frame of thinking and for our "fix-it" mentality.

SG: We are very invested in our own inventiveness. Humans have always risen to the challenge, and so they always will.

JM: Mm, but I don't think that's possible now.

SG: So that's maybe where the analogy with Shackleton's men doesn't hold.

JM: Because there's no rescue mission coming from outside.

SG: In Shackleton's case, when it finally became clear to him that no one was coming to rescue them – they had been gone for so long people assumed they must all be dead – Shackleton set out with five of his men in a ridiculously small boat to find help. They had to travel 800 miles by sea from Elephant Island to South Georgia, then travel 29 more miles on foot across the island, which required scaling perpendicular headlands and glaciers, to arrive at the small whaling station of Stromness. Miraculously, they did it. But then it took three more months and several failed attempts before they were able to rescue the other men who had been left behind. Everyone was alive – it's such a great story! What is so amazing is how those men survived under such unthinkable conditions. From everything I've read, it seems that the primary reason was hidden in the character and personality of Shackleton himself, a man with leadership abilities comparable to Martin Luther King or Gandhi.

JM: Presumably one way Shackleton was able to keep his crew alive was because he gave them an optimistic picture that eventually somebody would come from outside and rescue them.

SG: Nobody knew that for sure, least of all Shackleton. But here's another fascinating bit of the story: the men who made that final perilous journey to the whaling settlement felt the whole time that there was an invisible, otherworldly presence accompanying them – something like a guiding angel – and that this was the only reason they survived.

JM: There seems to be two relevant parts to the story you're telling. One might be applicable to our own situation today, the other not. The first is that sense of living, and trying to survive, in circumstances where there is little chance of being rescued, and so how do you cope with that? How do you do that? What isn't comparable is the sense that there is some other place that you can go to where, if you can only get there, rescue is possible. I'm not somebody who believes we can move to another planet!

SG: It's true, now that the problem is global and worldwide, there's no place else to go. Shackleton was dealing with a small community of stalwart men, and he managed, through the force of his own personality, to hold them together. But I'm not sure that today, no matter which leader might emerge on the world stage, that the global community can be held together – it is so at odds with itself. Plus, the new scale of the disasters happening is just so enormous.

JM: Do you think one of the challenges we face is holding the vision? Even in the face of catastrophe? If you consider Shackleton's story, there must have been period of time – I don't know how long, maybe a few days or hours when they were all thinking – Help! Are we going to get stuck in the ice? Are we not going to get stuck in the ice? And then there's suddenly the point when they go – Help! We're stuck in the ice! It's very difficult to project just when that moment will come for us, for us to see it. In a sense, we need to heighten our perception to be able to say, okay, this is the moment when we're stuck in the ice.

SG: Others have likened that moment to throwing a frog into boiling water. If the water is already boiling, the frog will jump out, but if the water is heating up slowly, the frog won't recognize the dangerous moment when the boiling point comes, and so it will die. Now the phrase being used for this moment is the "tipping point." It seems as if we may have now reached the tipping point.

For several decades we had all those World Watch studies foretelling disaster scenarios, and saying that we had a window of opportunity – 30 or 40 years to turn things around. But when does the window of opportunity close? Al Gore says we've reached the tipping point.

..like throwing a frog into boiling water. If the water is already boiling, the frog will jump out, but if the water is heating up slowly, the frog won't recognize the dangerous moment when the (tipping) point comes, and so it will die. It seems as if we may have now reached the tipping point.

JM: What intrigues me is the means by which we perceive the tipping point. Generally it comes out of scientific data and information. But I wonder whether there's a way for culture to visualize this tipping point to be able to see it more clearly?

SG: There might be, but once the tipping point is reached, will seeing it more clearly cut the mustard?

JM: In terms of Shackleton's plight, it was pretty useful. He had to come to the point of saying, okay, we're obviously stuck in the ice. Now what are we going to do? At the moment, I don't think we collectively understand the fact that we're stuck in the ice. That moment hasn't yet arrived, but when it does, we will need to see it clearly. Maybe science isn't the only means for doing this.

SG: Well, if you're right, and the only reason that we haven't done anything is because we don't yet see the tipping point, I wonder if, when the moment of revelation does happen, we will still be in a position to do something about it. I think we've had pretty strong intimations of a tipping point with things like hurricane Katrina. More than half the city of New Orleans was destroyed in a single day. And still the question remains – it hangs in the air with great divided opinions – do we enlist all the best technology and spend billions of dollars to fight the forces of nature? Do we rebuild this city, and show the world that we have the will to do it? Or do we capitulate, knowing that the same thing could easily happen all over again? It's another version of our starting question, really: what do you do when the ship is going down? If you take Katrina as the canary in the coal mine with regard to situations we will be facing in the future, I don't think the human race has figured out what it needs to do. I just hope we end up with some kind of guiding angel, rather like Shackleton's.

Six Cartoons

by Douglas Hofstadter

Douglas Hofstadter at Inga's December 2005

This series of six cartoons is meant to gently mock both the proponents and the opponents of the so-called "Singularity Scenario". The first three make fun of the Singularity doubters, while the final three make fun of the "Singularitarians", or the true believers.

#1 is meant to serve as an object lesson for doubters, since it reminds them that the greatest miracle of all -- the emergence of life from nonlife -- has already, without any doubt, taken place.

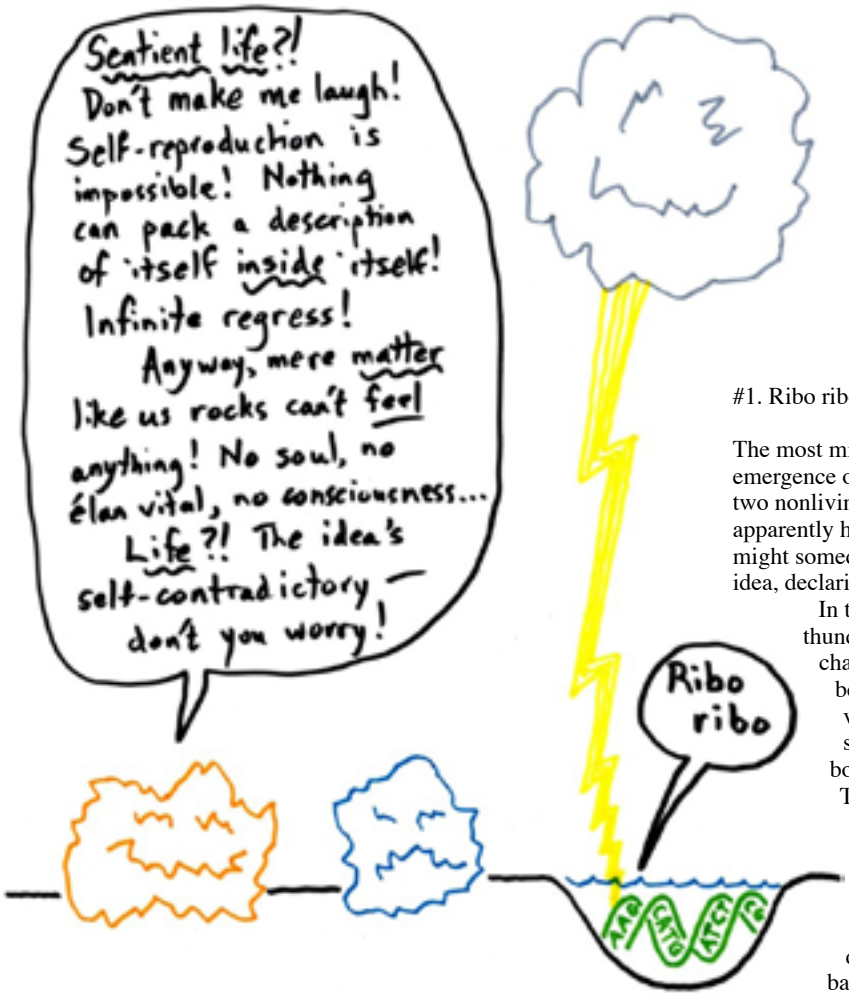
#2 reiterates the idea that the Singularity Scenario, no matter how crazy it might sound at first, is in truth anything but unprecedented, since life has already made a monumental hop -- from the sea to the land. This is meant as another blow to doubters.

#3 makes fun of certain anti-AI philosophers (especially John Searle) who seem overly eager to seize upon some magical "causal powers of the brain" and who proclaim that brains (but not computers) are made of the "right stuff", and who argue that this is why brains (but not computers) possess genuine feelings, genuine "aboutness", genuine "semantics", and genuine "intentionality" (all synonyms for the idea of consciousness).

#4, turning the tables and now mocking the Singularitarians, makes fun of those who claim that exponential trends in both computer hardware and software are inevitable and unstoppable, and that there are essentially no intrinsic physical limitations to computational speed, size, or cheapness, whether on the microscale (e.g., the idea of engineering on the subquark level) or on the macroscale (e.g., the idea of engineering on the whole-galaxy level).

#5 makes fun of the belief on the part of some Singularitarians that today's human beings, by keeping themselves in good enough physical shape, will be able to "live long enough to live forever", especially once they have reached the "bridge" (circa 2020) that crosses over from biological hardware to computer hardware, and thanks to which a brain will be replaced by a dynamic pattern of bits that can then dance and sparkle in superfast fashion, carrying out thinking at electronic, photonic, or even higher speeds, and thus, in brief, living the Life of Riley in Cyberheaven.

#6 mocks those "Singularitarians" who are convinced that once life has migrated upwards into from a biological into a computational substrate, then we are "home free" forever.

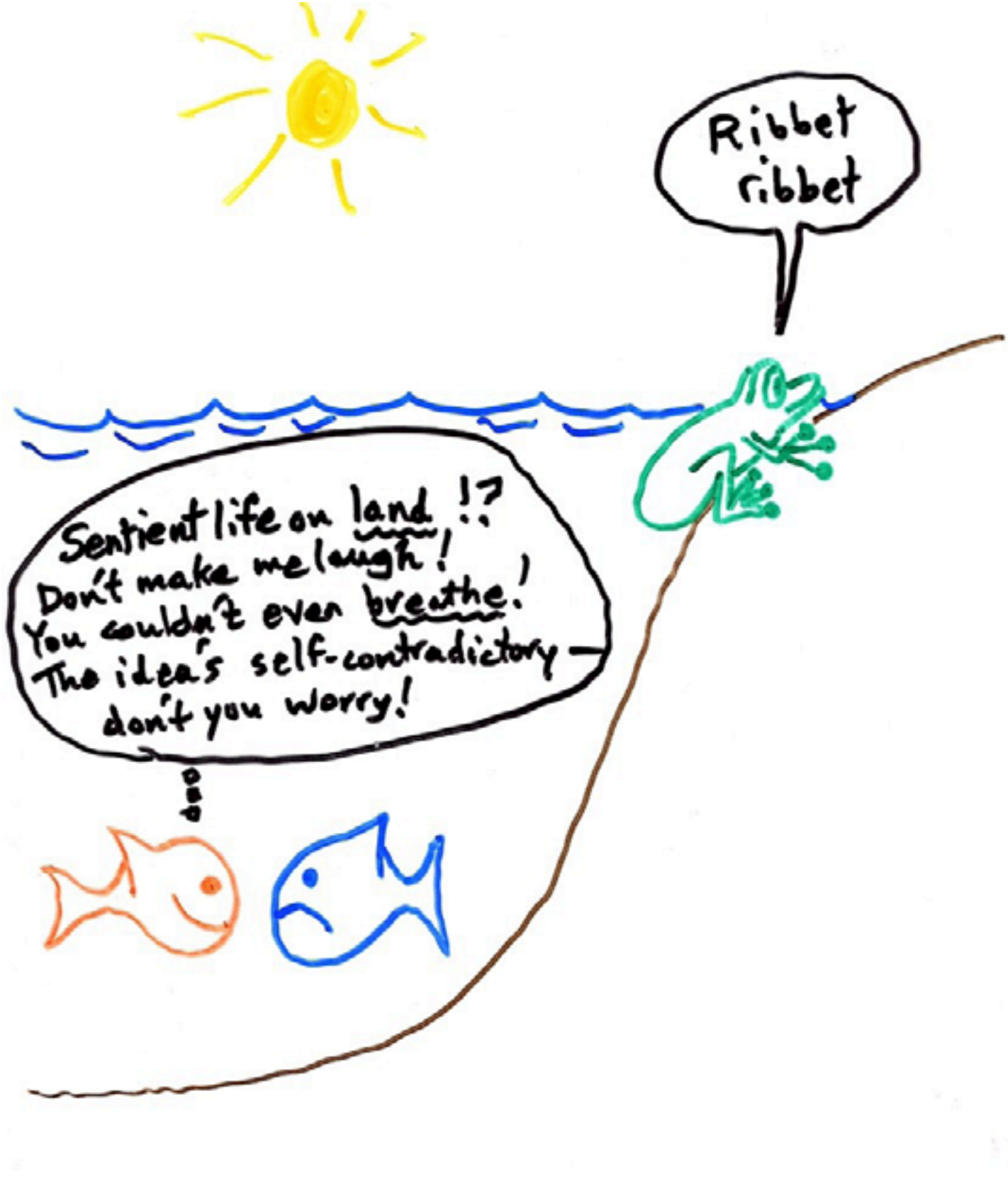


#1. Ribo ribo

The most miraculous transition ever to take place on our planet was the emergence of living beings from a nonliving substrate. Here we have two nonliving, inanimate rocks conversing with each other, one of them apparently having just voiced a worry that life and even conscious life might someday come to be, and the other one pooh-poohing the whole idea, declaring it to be full of holes and thus nothing to worry about.

In the meantime, unbeknownst to these rocks, an inanimate thundercloud has given rise to a bolt of lightning that has, by pure chance, put together a DNA molecule, which could conceivably be the first self-reproducing molecule on earth, and hence the very start of life. The word "Ribo" could be interpreted as standing either for "ribonucleic acid" (RNA), or for "deoxyribonucleic acid" (DNA), or for "ribosome".

There is, of course, an irony (more like an absurdity) of having supposedly nonsentient objects talking to each other and even expressing worries. This cartoon thus reflects the vacuity of the sentence "Before life emerged on earth, no one could have predicted that life ever would emerge on earth." Although the sentence seems to say something quite interesting, the strange fact is that in those bleak and barren days, there would (by definition) have been no one around to predict anything (or, for that matter, to think of those days as being "bleak and barren"), so in that sense the sentence is merely a tautology. And yet somehow, it strikes us as more than a trivial tautology.



Two fish are conversing. The one on the right has, it seems, heard a rumor that life might come to exist on another substrate – namely, land – and this rumor has perplexed and worried it. The other fish is reassuring the first one that this can only be some kind of hoax or pipe dream, since life couldn't possibly exist on land. There is only one "natural" substrate for life -- namely, the ocean.

And yet, on the right side, we see a frog emerging from the sea onto land, croaking "Ribbet ribbet".

#3. Robot robot

Two humans are conversing. The one on the right has, it seems, heard a rumor that life might come to exist in another substrate – namely, computers -- and this rumor is deeply perplexing and worrisome. The other person – apparently either the Berkeley philosopher John Searle or one of his many ardent disciples – is reassuring the first one about the vacuity and inanity of this rumor by quoting Searle's old saws that computers aren't made of "the right stuff" and that they have the "wrong causal powers" and that, thanks to Searle's thought-experiment known as the "Chinese room", computers have been shown to possess only "syntax" but no "semantics".

All the while, as computers are developing and becoming ever more flexible and more autonomous in all sorts of ways, one of them has become foresightful enough to predict the coming of robots, which (like the famous and humorous sci-fi robots R2D2 and C3PO from the "Star Wars" film series) may be extremely lifelike and may be just as sentient as any human being is.

#4. Rabbit rabbit

An ecstatic R-man ("R" presumably standing for "Ray" Kurzweil), flying through the air, is blithely declaring that the exponential trend of the growth of computer hardware and software will never hit a wall due to lack of physical resources or other physical limitations, but rather, that it will grow even more highly exponential instead of slowing down. Another ground-bound human being, however, seems very alarmed, screaming out in panic to the R-man that he is indeed about to hit a wall.

On the wall's far side, an exponential population explosion of bunny rabbits is taking place, and a desperately hungry fox happens upon this scrumptious source of nutrition, uttering "rabbit rabbit". All at once it is abundantly clear that whatever exponential growth the rabbits may have been enjoying, they will now enter a different phase of slowdown and diminution, while their natural opponent, the fox, enjoys its day in the sun.

#5. Ray bet Ray bet

Two sad old folks in wheelchairs are talking. It seems that they are not only reconciled to the end of life, but are in fact looking forward to it, since they are suffering so much. However, one of them seems to have heard rumors that perhaps human beings actually will live forever, which to them is terribly frightening. However, this notion sounds preposterous to the other, who points to biological facts such as that bodies are programmed to die (in order to make way for their progeny and their progeny's progeny, etc.). Immortality is thus a contradiction in terms, and is certainly nothing to worry one's head over.

And yet, nearby, there is a sprinting R-man who is popping a vast number of pills in order to stay young, and indeed, who is banking -- or rather, betting ("Ray bet, Ray bet") – that he will "Live Long Enough to Live Forever" (the subtitle of one of Ray Kurzweil's recent books). This hope is nourished by seemingly unending exponential curves and by all sorts of other modern technologies, including miracle medical methods for prolonging one's life until brain scans and computers are sufficiently sophisticated that one's brain can be "uploaded" into cyberspace, where it will – knock on wood! – cavort around with other "immortal" software spirits forever and ever, time without end.

#6. Reboot reboot

Two software beings who have been uploaded (in a monumental event that has been humorously called "The Rapture of the Nerds") to the magic land known as Cyberheaven Central" are talking about the minuscule chance that Cyberheaven might someday crash, a thought about which one of these beings is apparently quite worried. The other one, however, is describing all sorts of foolproof technical reasons that they live inside absolutely 100-percent crashproof hardware, which can never go wrong... go wrong... go wrong... go wrong....

Meanwhile, from out of the clear blue sky, a lightning bolt has struck the Command and Control Unit of Cyberheaven Central, and the latter has popped, fizzed, and sizzled, not to mention fallen apart in utter disaster.

Interview with Ray Kurzwiel

Ray Kurzeil with his collection of Tom Swift Jr. books, which he read as a child [photo by Michael Lutch, courtesy of Kurzweil Techologies, Inc.]

By Sander Olson

SO: Tell us about your background. When did you first work with a computer? When did you first begin studying computer/technological trends?

RK: I had the idea that I wanted to be an inventor since I was five. I first got involved with computers when I was twelve, programming some early computers, such as the 1401 and the 1620. I also built computers out of telephone relays. I began seriously modeling technology trends around 1980. I quickly realized that timing is the critical factor in the success of inventions. Most technology projects fail not because the technology doesn't work, but because the timing is wrong – not all of the enabling factors are at play where they are needed. So I began to study these trends in order to anticipate what the world would be like in 3-5 or 10 years and make realistic assessments. That continued to be the primary application of this study. I used these methodologies to guide the development plans of my projects, in particular when to launch a particular project, so that the software would be ready when the underlying hardware was needed, the needs of the market, and so on.

These methodologies had the side benefit of allowing us to project development 20 or 30 years in the future. There is a strong common wisdom that you can't predict the future, but that wisdom is incorrect. Some key measures of information technology – price-performance, capacity, bandwidth – follow very smooth exponential trends. I have been making predictions going back into the 1980s, when I wrote *The Age of Intelligent Machines*. That book had hundreds of predictions about the 1990s and 21st century based on these models, which have turned out to be quite accurate. If we know how much it will cost per million-instruction-per-second (MIPs) of computing in future points in time, or how much it will cost to sequence a base-pair of DNA or to model a protein, or any other measure of information technology at different points in time, we can build scenarios of what will be feasible. The capability of these technologies grows exponentially, essentially doubling every year (depending on what you measure). There is even a slow second level of exponential growth.

We will increase the price-performance of computing, which is already formidable and deeply influential, by a factor of a billion in 25 years, and we will also shrink the technology at a predictable pace of over one hundred in 3D volume per decade. So these technologies will be very small and widely distributed, inexpensive, and extremely powerful. Look at what we can do already, and multiply that by a billion.

SO: When did you first become aware of the term "singularity?" Did you use that term in your first book, *The Age of Intelligent Machines?*

RK: No. I first became familiar with it probably around the late 1990s. In my latest book, *The Singularity is Near*, I have really focused on the point in time where these technologies become quite explosive and profoundly transformative. In my earlier book, *The Age of Spiritual Machines*, I touched on that, and wrote about computers achieving human levels of intelligence and what that would mean. My main focus in this new book is on the merger of biological humanity with the technology that we are creating. Once nonbiological intelligence gets a foothold in our bodies and brains, which we have arguable already done in some people, but will do significantly in the 2020s, it will grow exponentially.

We have about 10^{26} calculations per second (cps) (at most 10^{29}) in biological humanity, and that figure won't change much in the next fifty years. Our brains use a form of electro-chemical signaling that travels a few hundred feet per second, which is a million times slower than electronics. The inter-neuronal connections in our brains compute at about 200 cps, which is also about a million times slower than electronics. We communicate our knowledge and skills using language, which is similarly a million times slower than computers can transmit information.

So biological intelligence, while it could be better educated and better organized, is not going to significantly change. Nonbiological intelligence, however, is multiplying by over 1,000 per decade in less than a decade. So once we can achieve the software of intelligence, which we will achieve through reverse-engineering the human brain, nonbiological intelligence will soar past biological intelligence. But this isn't an alien invasion, it is something that will literally be deeply integrated in our bodies and brains. By the 2040s, the nonbiological intelligence that we create that year will be a billion times more powerful than the 10^{26} CPS that all biological humanity represents. The word "singularity" is a metaphor, and the metaphor that we are using isn't really infinity, because these exponentials are finite. The real meaning of "singularity" is similar to the concept of the "event horizon" in physics. A black hole as physicists envision it has an event horizon around it, and you can't easily see past it. Similarly, it is difficult to see beyond this technological event horizon, because it is so profoundly transformative.

SO: Has there been one writer or researcher, such as Marvin Minsky or Vernor Vinge, who has had a predominant influence on your thinking?

RK: Both those individuals have been influential. Vernor Vinge has had some really key insights into the singularity very early on, There were others, such as John Von Neuman, who talked about a singular event occurring, because he had the idea of technological acceleration and singularity half a century ago. But it was simply a casual comment, and Vinge worked out some of the key ideas. Marvin Minsky was actually my mentor, and I corresponded with him and visited with him when I was in high school. We remain close friends and colleagues, and many of his writings on artificial intelligence, such as *Society of Mind* and some of his more technical work, have deeply influenced me.

SO: Many semiconductor analysts are predicting that the field of robotics will become the next major growth industry. When do you predict that the robotics industry will become a major, thriving industry?

RK: In the GNR revolutions I write about, R nominally stands for

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robotics, but the real reference is to strong AI. By strong AI, I mean artificial Intelligence at human levels, some of which will be manifested in robots, and some of which will be manifested in virtual bodies and virtual reality. We will go into virtual reality environments, and have nanobots in our brain that will shut down the signals coming from our nerves and sense organs, and replace them with the signals that we would be receiving if we were in the virtual environment. We can be actors in this virtual environment, and have a virtual body. But this virtual body doesn't need to be the same as our real body. We will encounter other people in similar situations in this VR. There will also be forms of AI which perform specific tasks, like narrow AI programs do today in our economic infrastructure. Our economic infrastructure would collapse if all these current narrow AI programs stopped functioning, but this wasn't true 25 years ago. So these task specific AI programs will become very intelligent in the coming decades.

So strong AI won't just be robots; that is only one manifestation. The R revolution really is the strong AI revolution. Billions of dollars of financial transactions are done every day, in the form of intelligent algorithms, automatic detection of credit card fraud, and so forth. Every time you send an email or make a telephone call, intelligent algorithms route the information. Algorithms automatically diagnose electrocardiograms and blood cell images, fly airplanes, guide "smart" weapons, and so forth. I give dozens of examples in the book. These applications will become increasingly intelligent in the decades ahead. Machines are already performing tasks that previously could only be done by humans, and the tasks that this covers will increase in the coming years.

In order to achieve strong AI, we need to understand how the human brain works, and there are two fundamental requirements. One is the hardware requirement, which you mentioned. It is relatively uncontroversial today that we will achieve computer hardware equivalent to the human brain's computing capacity—just look at the semiconductor industry's own roadmap. This is a roadmap into which the semiconductor industry has put enormous effort. By 2020, a single chip will provide 10^{16} instructions per second, sufficient to emulate a single human brain. We will go to the third dimension, effectively superseding the limits of Moore's law, which deals only in 2-d integrated circuits. These ideas were controversial notions when my last book *(The Age of Spiritual Machines)* was published in 1999, but is relatively uncontroversial today.

The more controversial issue is whether we will have the software, because it is not sufficient to simply have powerful computers, we need to actually understand how human intelligence works. That doesn't necessarily mean copying every single pattern of every dendrite and ion channel. It really means understanding the basic principles of how the human brain performs certain tasks, such as remembering, reasoning, recognizing patterns and so on. That is a grand project, which I refer to as reverse-engineering the human brain, which is far further along than many people realize. We see exponential growth in every aspect of it. For instance, the spatial resolution of brain scanning is doubling every year in 3D volume. For the first time we can actually see individual interneuronal connections in living brains, and see them signaling in real time. This capability was not feasible a few years ago. The amount of data that we are obtaining on the brain is doubling every year, and we are showing that we can turn this data into working models, and in the book I highlight a couple of dozen simulations of different regions of the brain. For example, there is now a simulation of the cerebellum, which is an important region of the brain devoted to skill formation. This region comprises over half of the neurons of the brain.

I make the case that we will have the principles of operation understood well within twenty years. At the end of the 2020s, we will have both the hardware and software to create human levels of intelligence. This includes emotional intelligence, which is really the cutting edge of intelligence, in a machine. Given that machines are already superior to humans in certain aspects, the human-intelligent computer combination will be quite formidable, and this combination will continue to grow exponentially. Nonbiological intelligence will be able to examine its own source code and improve it in an iterative design cycle. We are doing something like that now with biotechnology, by reading our genes. So in the GNR revolutions I write about, R really stands for intelligence, which is the most powerful force in the universe. It is therefore the most influential of the revolutions.

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SO: Nanotechnology plays a key role in your forecasts. What advice would you give to someone wanting to invest today in nanotechnology corporations?

RK: Nanotechnology developments are currently in their formative stages. There are early applications of nanotechnology, but these do not represent the full vision of nanotechnology, the vision that Eric Drexler articulated in 1986. No one was willing to supervise this radical and interdisciplinary thesis except for my mentor Marvin Minsky. We have shown the feasibility of manipulating matter at the molecular level, which is what biology does. One of the ways to create nanotechnology is to start with biological mechanisms and modify them to extend the biological paradigm—to go beyond proteins. That vision of molecular nanotechnology assembly—of using massively parallel, fully programmable processes to grow objects with remarkable properties—is about twenty years away. There will be a smooth progression, and early adaptor applications, many of which I discuss in the book.

There are early applications in terms of nanoparticles. These nanoparticles have unique features due to nanosize components, but this is a slightly different concept. We are using the special properties of nanoscale objects, but we are not actually building objects molecule by molecule. So the real revolutionary aspect of nanotechnology is a couple of decades away, and it is too early to say which companies will be the leaders of that. Intel sees that the future of electronics is nanotechnology, and by some definitions, today's electronics are already nanotechnology. Undoubtedly, there will be small corporations that will dominate. When search engines were formative, it would have been difficult to foresee that two Stanford undergrads would dominate that field. Nanotechnology is already a multi-billion dollar industry which will continue growing as we get closer to molecular manufacturing. When we actually have molecular manufacturing, it will be transforming—we will be able to inexpensively manufacture almost anything we need from feedstock materials and these information processes.

SO: You write in *The Singularity is Near* of feeling somewhat alone in your beliefs. How has the mainstream scientific community responded to your prognostications?

RK: Actually quite well. The book has been very well received; it has gotten very positive reviews in mainstream publications such as the *New York Times* and the *Wall Street Journal*. It has done very well, it has been #1 on the science list at Amazon, and ended up the fourth best selling science book of 2005 despite coming out at the end of the year. The *New York Times* cited it as the 13th most blogged about book of 2005. In terms of group intellectual debate, I believe that it has gotten a lot of respect, and has been well received. There are individuals who don't read the arguments and just read the conclusions. For some of these individuals, the conclusions are so distant from the conventional wisdom on these topics that they reject it out of hand. But for those who carefully read the arguments, the response is generally positive. This is not to say that everyone agrees with everything, but it has gotten a lot of serious response and respect. I do believe that these ideas are getting more widely distributed and accepted, I am obviously not the only person articulating these concepts. Nevertheless, the common wisdom is quite strong—even among friends and associates, the common wisdom regarding life cycle and the concept that life won't be much different in the future than it is today—still permeates people's thinking. Thoughts and statements regarding life's brevity and senescence are still quite influential. The deathist meme (that death gives meaning to life) is alive and well.

The biggest issue, which I put out in the beginning of *Singularity Is Near*, is linear vs. exponential thinking. It is remarkable how thoughtful people, including leading scientists, think linearly. This is just wrong, and I make this case, showing dozens of examples. But even though someone may be an expert regarding one aspect of technology or science, doesn't mean that they have studied technology forecasting. Relatively few futurists/prognosticators really have well-grounded methodologies. The common wisdom is to think linearly, to assume that the current pace of change will continue indefinitely. But this attitude is gradually changing, as more and more people understand the exponential perspective and how explosive an exponential can be. That is the true nature of these technology trends.

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SO: What about other technologies and industries, such as the textile, aerospace, or automotive industries? Are all technology fields experiencing exponential growth?

RK: Information technology and information processes progress at an exponential pace. Biological evolution itself was an information process—the backbone is the genetic code, which is a digital code. I show in my book how that has accelerated very smoothly, in terms of the growth of complexity. The same thing is true of technological evolution, when it has to do with information. If we can measure the information content, which we can readily do with things like computation and communication, then we can discern that it progresses in this exponential fashion and subject to the law of accelerating returns.

In terms of national competitiveness, the key issue is that we are not graduating enough scientists and engineers. ...this is about what fields teenagers choose to enter.

The information technology needs to get to a point where it is capable of transforming an industry, and biology is a good example. Biology was not an information technology until recently—it was basically hit or miss. Drug development was called drug discovery, which meant that we didn't know why a drug worked and we had no theory of its operation. These drugs and tools were relatively crude and had many negative side effects. 99.9% of the drugs on the market were designed in this haphazard pre-information era fashion.

The new paradigm in biology is to understand these processes as information processes, and to develop the tools to reprogram these processes and actually change our genes. We still have these genetic programs that are obsolete. The fat insulin receptor gene tells the body to hold on to every calorie, since it is programmed to anticipate that the next hunting season may be a failure. That was a good program 10,000 years ago, but is not a good program today. We have shown in experimental studies with mice that we can change those programs. There are many genes that we would like to turn off, and there is also new genetic information that we would like to insert. New gene therapy techniques are now beginning to work. We can turn enzymes on and off, which are the workhorses of biology, and there are many examples of that. Most current drug development is through this rational drug design. So biology is becoming an information technology, and we can see the clear exponential growth. The amount of genetic data we sequence is doubling every year, the speed with which we can sequence DNA is doubling every year, and the cost has come down by half every year. It took 15 years to sequence the HIV virus, but we sequenced the SARS virus in 31 days. AIDs drugs cost $30,000 per patient per year fifteen years ago, but didn't work very well. Now they're down to $100 per patient per year in poor countries and work much better.

Fields such as energy are still not information technologies, but that is going to change as well. For instance, in *Singularity* I describe how we could meet 100% of our energy needs through renewable energy with nanoengineered solar panels and fuel cells within twenty years, by capturing only 3% of 1% of the sunlight that hits the Earth. That will happen within twenty years, and it will be related to information technology, since it will be able to meet our energy needs in a highly distributed, renewable, clean fashion with nanoengineered devices. We will ultimately transform transportation in a similar way, with nanoengineered devices that can provide personal flying vehicles at very low cost. The transportation and energy industries are currently pre-information fields. Ultimately, however, information technologies will comprise almost everything of value, because we will be able to build anything at extremely low cost using nanoengineered materials and processes. We will have new methods of doing things like flying and creating energy.

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SO: You have emphasized the superior mechanical and electronic property of carbon nanotubes. When do you anticipate nanotubes being embedded in materials? When will we see the first computers with nanotube components?

RK: There is actually a nanotube-based memory that may hit the market next year. This is a dense, two-dimensional device that has attractive properties. But three-dimensional devices are still about one and a half decades away. There are alternatives to nanotubes, such as DNA itself. DNA has potential uses outside of biology, because of its affinity for linking to itself. DNA could also be used structurally. But the full potential of three-dimensional structures based on either carbon nanotubes or DNA, is a circa 2020 technology.

SO: Most predictions of future technological developments have been inaccurate. What techniques do you use to improve the accuracy of your prognostications?

RK: I have a team of people that gathers data on many different industries and phenomena, and we build mathematical models. More and more areas of science and technology are now measurable in information terms. I use a data-driven approach, and I endeavor to build theoretical models of why these technologies progress. I have this theory of the law of accelerating returns, which is a theory of evolution. I then try to build mathematical models of how that applies to different phenomena and industries. Most futurists don't use this type of methodology, and some just make guesses. Many futurists are simply unaware of these trends—they make linear models. It is often said that we overestimate what can be done in the short term, because developing technologies turns out to be more difficult than we expect, but dramatically underestimate what can be achieved in the long term, because people think linearly.

SO: The Government has traditionally played a pivotal role in developing new technologies. Is the U.S. Government doing enough to support the nascent nanotechnology or the AI industries? Do these industries require Government support at this point?

RK: These industries will both be propelled forward by the enormous economic incentive. Nanotechnology will be able to create almost any physical product we need at very low cost. These devices will be quite powerful because they will have electronics and communications embedded throughout the device. So there is tremendous economic incentive to develop nanotechnology, and the same is true of artificial intelligence. Basic research has an important role to play—the Internet, for instance, came out of the Arpanet. The new world wide mesh concept—of having every device not

simply connected to the net but actually become a node on the net, sending and receiving both its own and other people's messages—this arose out of a department of defense concept. It is now being adopted by civilian, commercial corporations. DARPA is actually playing a forward-looking role in such technologies as speech recognition and other AI fields.

In terms of national competitiveness, the key issue is that we are not graduating enough scientists and engineers. The figures regarding numbers of individuals receiving advanced technical degrees are dramatically growing in China, Japan, Korea, and India. These figures actually resemble exponential curves. China in particular is greatly outpacing the U.S., producing scientists and engineers, both at the undergraduate and doctoral level, in every scientific field. Although this is a real concern, there is now one integrated world economy, so we shouldn't see this problem as simply the U.S. vs. China. I am glad to see China and India economically engaged, and this isn't a zero-sum game—Chinese engineers are creating value. But to the extent that we care about issues such as national competitiveness, this is a concern. In the end, however, this is about what fields teenagers choose to enter.

The U.S. does lead in the application of these technologies. I speak at many conferences each year, including music conferences, graphic arts conferences, library conferences, and so on. Yet, every conference I attend reads like a computer conference, because they are so heavily engaged in computer technology. The level of computer technology used in any of a great diversity of fields is quite impressive.

SO: How do you envision the world in 2015? What economic and technological predictions would you make for that year?

RK: By 2015, computers will be largely invisible, and will be very small. We will be dealing with a mesh of computing and communications that will be embedded in the environment and in our clothing. People in 2005 face a dilemma because, on the one hand, they want large, high-resolution displays. They can obtain these displays by buying expensive 72" flat-panel plasma monitors. But they also want portable devices, which have limited display capabilities. By 2015, we will have images input directly onto our retinas. This allows for a very high-resolution display that encompasses the entire visual field of view yet is physically tiny. These devices exist in 2005, and are used in high-performance applications, such as putting a soldier or a surgeon into a virtual reality environment. So in 2015, if we want a large, high-resolution computer image, it will just appear virtually in the air. We will have augmented reality, including pop-up displays explaining what is happening in the real world. We will be able to go into full-immersion, visual auditory virtual reality environments.

We will have useable language technologies. These are beginning to emerge, and by 2015 they will be quite effective. In this visual field of view, we will have virtual personalities with which you can interact. Computers will have virtual assistants with sufficient command of speech recognition that you can discuss subjects with them. Search engines won't wait to be asked—they will track your conversation and attempt to anticipate your needs and help you with routine transactions. These virtual assistants won't be at the human level, that won't happen until we have strong AI. But they will be useful, and many transactions will be mediated by these assistants. Computing will be very powerful, and it will be a mesh of computing. Individuals who need the power of a million computers for 25 milliseconds will be able to obtain that as needed.

By 2015, we will have real traction with nanotechnology. I believe that we will be well on the way to overcoming major diseases, such as cancer, heart disease, and diabetes through the biotechnology revolution that we talked about above. We will also make progress in learning how to stop and even reverse the aging process.

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Interview with Jaron Lanier

Jaron Lanier from the CDROM acompanying Clicking In, edited by Lynn Hershman Leeson, 1996

By Alex Steffen

AS: You have said that there remain "earthshaking questions" about how computation, biotechnology, and materials science will develop in this new century. You went on to say that you see "cybernetic totalism" as "the characteristic delusion of our times," and a danger. Why?

JL: Cybernetic totalism is the confusion of linear and nonlinear systems. A typical example of that is the enormous amount of funding and attention devoted to ideas about artificial intelligence that clearly can be seen to be hanging on an irrational idea about what intelligence might be and might not be. We have a notion that—just because you can show that a Turing machine, a common computer, can hypothetically do an enormous range of things—somehow all analytical problems are solvable. It's sort of a new style of reductionism. Instead of saying my little abstraction proves everything, it's saying that because we've proved a hypothetical equivalent between some range of computational problems, there's no functional difference in the amount of time or effort it might take to solve those problems. All problems are solvable. There's another level though, an aesthetic or spiritual level. A whole class of scientists and engineers have adopted what you might call a new religion, where they hope to find comfort in the face of life's uncertainty, especially in relation to questions of mortality, by turning themselves into machines, or hope to find immortality by downloading themselves into computers—that sort of thing.

A whole class of scientists and engineers have adopted what you might call a new religion, where they hope to find comfort in the face of life's uncertainty, especially in relation to questions of mortality, by turning themselves into machines, or hope to find immortality by downloading themselves into computers—that sort of thing.

AS: What kinds of questions might these attitudes obscure?

JL: Essential questions about how far we can go with technology and how fast. Some kinds of problems we know are hard to solve, but they're hard to solve in a brute force way. We understand how hard we have to work to solve them. The best example of this is weather prediction. We have a pretty good idea of the nature of the problem of predicting the weather, and we know that if we want to do a better job of it, we have to get so much better at writing software for very large-scale computation, and we also have to get so much better at gathering very large amounts of data, and so forth. Our engineering process, for weather prediction, is relatively linear—we know that if we put in given effort, money, and intellectual struggle, we'll get out a roughly commensurate improvement. The natural system itself is complex, but the engineering effort to model it is a reasonably linear thing. Now in the case of studying how the human mind works, we have an entirely different scenario. We don't have any idea what low-hanging fruit we might be about to discover, and we don't have any idea what aspects of human cognition might make it extremely, extremely difficult to come up with a useful model. This is true for a whole lot of questions in biology. Now, it's rare to find a computer-oriented scientist or engineer who's able to recognize the difference between these two kinds of problems. About once a month, there'll be a headline that says researchers can tell us that some gene has something to do with an aspect of behavior—that, for instance, it might contribute to an aspect of depression—but really, the results they have are the most meager sort of explanations based on terms that we don't even fully know how to define yet, so we don't have any sense of how important these results are, or even if they're in any way helpful for building a bigger picture. This is a classic confusion of linear and nonlinear results.

That idea leads to this religious feeling of imminent transcendence. It's a completely irrational stream of thought. It's sort of a nerd's path to religious ecstasy.

AS: Would it be fair to say that one of the characteristic beliefs of cybernetic totalism is that if enough brute force is applied, all problems are linear?

JL: Exactly. Yes. And since brute force comes in the form of Moore's Law, and the amount of brute force we can apply is growing at an exponential rate, there's this idea that all problems are solvable, very soon. And it's a short step to saying essentially there are no problems. That idea leads to this religious feeling of imminent transcendence. It's a completely irrational stream of thought. It's sort of a nerd's path to religious ecstasy.

AS: You have spoken about the errors that can arise when we move from treating Moore's Law as a (thus far) accurate prediction about the speed at which hardware improves, to treating it as a metaphor for the speed at which our power to understand and manipulate the world improves. Why is this an important distinction? What happens when we get it wrong?

JL: That distinction's important because honest self-assessment is the first step in effective action of any kind. That's why the entire scientific method is designed to prevent us from fooling ourselves. One place you see this fallacy is in artificial intelligence. Go back to the very origins of cybernetic totalism and visit poor Alan Turing—who probably made as big a single contribution to protecting human freedom as any single person, having broken the Nazi's secret Enigma code during World War II. You'd find him under house arrest, being forced to take massive doses of female sex hormones to treat his homosexuality and developing breasts and becoming increasingly depressed, then eventually committing a strangely eloquent suicide in which he injects cyanide into an apple and then eats it. During that time he develops this longing for transcendence

the idea that we can fully replicate [consciousness] in machines, and then trust those machines to do our thinking for us, is really a departure from reality. The more we imagine ourselves becoming machines, the more we risk losing our humanity. We're modeling ourselves after our own technologies—becoming some sort of anti-Pinocchios—and it's insane.

(or psychological denial if you prefer). He imagines himself a computer and creates this test—known now as the Turing test—where a judge is asked to distinguish a computer from a person based only on written interaction with each, and declares that if the judge can't distinguish them, the computer is as smart as a human. The problem with Turing's idea is not only that the judge can only compare one very limited means of human communication, but that the human in the test is just as likely to become stupid by conforming to the artificial limits of the situation as the machine is to be getting smarter. Artificial intelligences are not people. They're not really even intelligent. They're programs. We forget this at our peril.

AS: Sherry Turkle has said that she thinks it's a sign of great progress that little children take their apparently intelligent toys at "interface value." You've said the danger is not that runaway AIs will get super-intelligent, take over the world and stop needing us, but that mock AIs will be accepted as intelligent, even sapient, when they aren't, and thus obscure the fact that somebody who is error-prone and serving his own agenda has programmed them.

JL: I think this is still true, but what I'm getting at is something larger. The claim of machine sentience is fundamentally false. The idea of sentient technology grabs attention and helps sell the technology. But we don't fully grasp what consciousness itself means, so the idea that we can fully replicate [consciousness] in machines, and then trust those machines to do our thinking for us, is really a departure from reality. The more we imagine ourselves becoming machines, the more we risk losing our humanity. We're modeling ourselves after our own technologies—becoming some sort of anti-Pinocchios—and it's insane.

We should do everything we can to avoid singularities. A singularity is a sign that we've failed.

AS: You sound worried about where we're headed.

JL: I don't know what sort of future we're entering here, but it's entirely possible that the twenty-first century is going to be a profoundly unhappy one—a century in which there isn't much more technological advancement because the climate crashes or we slide into a series of horrible wars or whatever. But let's imagine that's not the case, and that there's a large portion of the world where things continue to work. Imagine, too, that Moore's law continues to hold true. If that's the future we enter, then we'll all live in a world where every facet of our lives will be saturated in technology. In that world, this new religion—cybernetic totalism—will be much more mainstream. Instead of just being a cult among a relatively small group of scientists and technologists, it could become a major movement. The metaphor I'd draw is to something like Marxism in the nineteenth century—there's a seed of ideology here, and it's not certain how big it will get or how far from its origins it will drift. It's possible this whole thing will just float away and it won't be all that important to criticize it. It seems important to come up with a critical response to it now, though, because I think it'd be a really grossly dysfunctional mass movement. All forms of fundamentalism dehumanize those who don't share their ideas. But cybernetic totalism in a sense dehumanizes the human race, saying that people are just a stepping stone to some other evolutionary machine being or destination. No person matters anymore. This is incredibly dangerous. If we had some way of knowing that we were on the path to creating some greater being, maybe we would all be willing to commit suicide to bring it about. The problem is, because of the Turing test paradox, we can't know that. Any postulated posthuman being is at this point absolutely a matter of fantasy.

AS: And yet, there's very little intelligent critique of the idea of The Singularity. Most people who criticize it seem to be just run-of-the-mill technophobes.

JL: Unfortunately, of the people who've written works cautioning against the ideology of The Singularity, few have technological backgrounds. Part of it is that the preponderance of members of the elite computer science community are at least partially sympathetic. Another is that many engineers are relatively tone-deaf to aesthetics or morality because they're people who dwell in the realm of value-free problem solving.

There's something about that that's sort of charming. But it leads to very few critics having any idea what they're talking about. There's a gap between those who understand these technologies and the, I almost said, secular world.

AS: You write of a danger that "the gulf between the richest and the rest could become transcendently grave. The possibilities that they will become essentially different species are so obvious and so terrifying that there is almost a banality in stating them. The rich could have their children made genetically more intelligent, beautiful, and joyous. Perhaps they could even be genetically disposed to have a superior capacity for empathy, but only to other people who meet some narrow range of criteria. Even stating these things seems beneath me, as if I were writing pulp science fiction, and yet the logic of the possibility is inescapable." You said that you were concerned that medical and biological research were tending to favor outcomes that would make real advances available only to a tiny fraction of the Earth's people. Why is this a problem, and what can be done about it?

JL: This is the thing I really most worry about. Out in the wider world, though, there's a rebellion brewing precisely as a result of the sort of wild pronouncements about technology you see more and more often in press releases from places like MIT and Berkeley. There has long been a sense of economic injustice, but there's a brewing sense of spiritual injustice. There's this sense that it's one thing if rich people in America

drive fancy cars and have lower infant mortality, but this notion that some elite somewhere is defining the soul or making the soul into an obsolete idea or is going to transform what it means to be human or is going to be first in line for immortality—that idea strikes so deep it creates a sense of panic. And I believe this is the explanation for one of the weird features of our time, that every major religion has a terribly violent fundamentalist wing at the same time. I think if this continues, we'll get the worst of both—on the one hand, the people who fear being left behind will believe that the first are getting everything—not only riches, but immortality and super-intelligence and whatever—while on the other hand, because they're fooling themselves about what they do and don't really know, those who are first in line won't be getting nearly what they dream of. They may get riches. They may get much greater longevity and designer babies. But they certainly won't be getting the transcendence they dream of. They'll get a world with all the conflicts and little of the progress.

AS: What do you think of the adoption of open source as a model for how people might create distributed, collaborative, emergent political movements for evaluating and guiding technological policy (for example, the "open source biology" movement)?

JL: Right now we know how to act on two paradigms. We can use an open, free, collaborative, equality-oriented system, sort of the Napster model—whether we're talking about code or music or medical information. Or we can do this proprietary system, where everything's closed and owned and those who are first in line become arbitrarily rich, like Bill Gates. I think there is a sort of split in our culture, with one half committed to the past, to the idea of paying for the use of Mickey Mouse even though Walt Disney's been dead for decades, and the other half ideologically crying for the "free as in beer" model, where everyone can use anything. The problems with intellectual property method have been very well documented by those who oppose it. Among those problems are that, applied to music, you get a terribly corrupt music industry that puts out terrible music based on the fantasies industry executives had when they were adolescents. Applied to software, you get monocultures of inferior code at high prices. Applied to medicine, you get pharmaceutical companies that drive the process of diagnosis, multi-tiered health care, and millions dying of easily preventable diseases. And so on. The problem is that the open and free solu-

tions also have real shortcomings. One is that a relatively small number of people have the ability to totally disrupt the community—the spam problem. But open systems suffer from two other problems. The "housekeeping" problem: it's hard to find people to do the boring, routine tasks that are required for a functional system. More importantly, open systems have a hard time plotting strategy and encouraging major risk-taking for innovation. There's a trackless wilderness in between the two, of course.

AS: You said that creativity is now the source of innovation, that innovation is the source of wealth, but that there's "creative inequity" between the classes, which is far more troubling than the financial inequities, that "spreading creativity is a survival question: the alternative to a planet of artists is a planet of corpses."

JL: What I mean is this—the level of complexity in the problems we face is such that they can only be solved with the help of a whole lot of creative people. We have to look at distributed models of creativity, like gaming communities. Where there's a shared virtual world, and you invite everyone to be creative, what you get instead of universal creativity is a power law distribution where a very small number of people are very creative and do all sorts of amazing things, and then a slightly larger number make the occasional interesting contribution, but a vast number of people are either not very creative, or their creativity doesn't amount to much. So widespread creativity would seem to have little value, but there's a paradox that you often can't find those uniquely valuable creative people unless you invite everyone, and that if you invite everyone, the results of creativity can spread remarkably rapidly. The dawn of the Web was driven by something like this. When the Web started up, there was a period of about a year when there was absolutely no commercial interest in it, and during that time it spread from nothing to tens of millions of users, based only on the urge to create and the urge to connect. There was no advertising, no charismatic figure, and no money to be made; no structure, no hierarchy. This is one of the most optimistic signals we've ever gotten about how the future could be better. Take Grameen. Grameen Bank is a celebrated experimental bank which pioneered the idea of microfinance. Grameen makes tiny loans to groups of people who vouch for each other, say villagers in Bangladesh. These are tiny loans, to start tiny businesses, but the recipients are mutually responsible for one another, so the loans are almost always repaid. It turns out to be a great banking method, yet it also has an incredible social effect, of spurring the growth of small, local businesses. The idea is spreading now, but I've wondered if we might apply a similar principle to promoting creativity—perhaps having groups of people be mutually responsible for using resources together to solve some problem creatively. At any rate, we need to find new methods to encourage systems of creativity to grow. We need to figure out a way for nearly everyone to have an opportunity to contribute to something vital and constructive, to have a way to find yourself and make a name for yourself without resorting to conflict and violence and terror.

AS: I read that the total number of children and teenagers in the world — over two billion — is more people than were ever alive from when humans first walked upright until after 1930. This wave of kids is the biggest baby boom in all of history. For most of those kids, there are few avenues for education, meaningful work, or participation in democracy.

JL: This global teenager problem is terribly scary. The first time a society encounters mass media, its propaganda goes insane. Europe, Japan, and America went through that in the first half of the twentieth century, and we fought two world wars. China went through it during the Cultural Revolution. The Muslim and African worlds are going through that now. They're still in the middle of their first encounter with the full force of modern propaganda. It just makes people nuts, and it takes a generation to get used to it, to get desensitized. The coincidence of this wave of teenagers with a third wave of McLuanesque shock is incredibly alarming. The only way to respond to this is through technology. It's the only conceivable way to educate and involve several billion people, right away. There's no time to build enough new schools, or train enough new teachers. We have to imagine somehow inviting all these people online, imagine propagating some sort of cheap wireless devices that create widespread high-quality access to needed information and collaboration across the entire developing world, imagine accelerating the process whereby kids in the Third World can become jaded to propaganda and open to new frontiers in their own lives—become educated, and capable of creating real work for themselves, and able to solve their communities' problems with collective wisdom. I don't know of any plans to do this, but every happy scenario I can imagine has something like this in it. If I were in charge, it would be my first priority.

Spreading creativity is a survival question: the alternative to a planet of artists is a planet of corpses.

AS: What keeps you awake at night?

JL: That we're losing sight of an extremely simple common sense idea—that there's a set of ideas (democracy, technological optimism, entrepreneurship, the sense we can find commonality through science and exploration) which have provided us with almost everything good about our world. That those ideas are fundamental to any hopes we have. The anti-globalization sort of people have become entirely too cynical. They just view the whole class of entrepreneurial and technologically optimistic people with suspicion. As a result, they discount the very real almost utopian possibilities if we all learn better ways of working together. Then there are the religious fundamentalists, who just seem to want to go back to the twelfth century. Nobody's advocating for progress and problem-solving and the really good things about modernity.

AS: There are very few people out there who are willing to stand up for rational inquiry and the humanist project as something that benefits all mankind?

JL: Exactly. It's extraordinary. I am a humanist, and it's very hard to find allies these days. The academy's gone all postmodern, and the sciences seem dominated by these extremes of commercialism and radical cybernetic totalism. We don't have any major voices advocating this most basic, simple, and obvious thing—and that keeps me up at night. I like to think of myself as an out-there thinker, exploring the far reaches, but I end up spending a lot of time talking about this simple idea. It's so disheartening and surprising to feel alone so often in doing that in technological and scientific circles. There's so much talk about singularities. And if you believe in the ability to rationally improve destiny, a singularity would be a terrible thing, because by definition it'd be something we don't understand.

AS: You said "We should do everything we can to avoid singularities. A singularity is a sign that we've failed." Is that what you meant?

JL: Yes. We live in this remarkable time, and the possibilities are astounding. But we need a rate of progress that allows us sufficient predictability to know we're making good decisions. We have to go fast enough to deliver solutions to the world's problems in some kind of useful time frame, but slow enough that we retain control. That's not easy.

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Interview with John Searle

John Searle in Paris, 6/28/04. Photo by Anne Selders.

By Julian Moore

JM: Thanks very much for agreeing to be interviewed. It is for me a personal pleasure because it's a chance to look into some of the things that have been wrapped together in your book, *Mind, Language, and Society*. It all seems to go back in the very beginning to speech acts....

JS: It does, yes, you're right.

JM: ... but was that a conscious campaign?

JS: No. No, I was always solving one problem at a time, and then eventually it occurred to me, these hang together. See, when I worked on speech-acts, I knew eventually I'd have to pay a debt to the philosophy of mind, because I was using these difficult notions like belief and desire and intention and action. So I thought, well eventually I might have to sit down and work it out. But when I began to work on it, it seemed clear to me there is a theory of mind implicit already in the theory of speech-acts, so I wrote a book called *Intentionality*, where I spelled that out and of course, its one thing to have the germ of an idea and another thing to work it out in detail, and then when I worked it out in detail it led into general problems in the philosophy of mind. Then in the course of doing that I discovered that there were all these crazy things being said in the philosophy of mind, that the brain is really a computer and the mind is the software, and all that kind of stuff. So I wrote a book attacking that, called *The Rediscovery of the Mind*. And then there is a problem that has always bothered me, and that's about the nature of social reality, and I thought it was implicit in my philosophy of language, a theory of social reality, so I wrote a book about that, called *The Construction of Social Reality*. So there's a sense in which in your life you write one book – it just gets bigger and bigger!

JM: The chapter that grows into a book, the book that grows into a series...

JS: That's right. And it looks at the end as if, well, you must have planned this from the time you were a kid, but that's not the way it was. It just grew on its own, but it grew in a coherent fashion.

JM: In talking about the creation of a social reality, does that hark back to your early student days as a radical activist in looking for explanations of the unrest at the time?

JS: It does, but in an odd way. It occurred to me during the period of student unrest that we really didn't even have a vocabulary to describe it. The vocabulary we had was either the silliest kind of journalism or it was too abstract, you know, Platonic theories of the state and of justice. And I was puzzled at the time by how it could be the case in Berkeley that a group of students with very few faculty supporters – I was for quite a while the only regular faculty member who supported the student movement – how we could defeat the established authority. And I actually wrote a book about *that* too, kind of a footnote to my other books, called *The Campus War*. It wasn't so much that I thought that the period of student unrest demanded a theory of society, but that any theory of society would have to account for this, and I didn't know how to do it. And I still think to some extent this is true and I would like to write another book about this. You see, we lack a political philosophy of the middle distance. Politics is either discussed on the level of day-to-day journalism or in terms of abstract theories of the state like Jack Rawls' *A Theory of Justice*. But we don't have a vocabulary that will enable us to say or even pose the question, "What the hell happened to socialism? Why did it fail? What happened?" I mean, it's not enough to say, "Well, Margaret Thatcher rescued the Labour Party by killing socialism." Maybe that's true, but that's still at the level of journalism. So I think all of that needs to be done, and I haven't done it yet, but I did the beginning when I tried to work out a theory of what these social entities are anyway, what is this structure of social and institutional fact?

JM: You put it in those terms, but I wondered whether perhaps there is a mental life of society in the states that it goes through, the dialogue that it seems to have with itself?

JS: Well, I think there is a deep level at which something like that is right. On the account that I give, social reality is a matter of what people think, and what they think is a matter of how they talk to each other, and relate to each other. So you can't have a social reality without a language, not a *human* social reality without a language. And you have to have a set of institutional structures where the linguistic representations are partly constitutive of the facts. So this is an interview. And because we both know it's an interview, we know what to do. And if it were a cocktail party or a fist-fight, then we'd know how to behave differently, but we have to have some way to represent the social realities.

JM: But *how* can we know what to do? In talking about speech-acts in conversation, and following on from J.L. Austin's work, you talked about illocutionary and perlocutionary acts. How do they differ?

JS: Well, that's easy. I think the perlocutionary act is a matter of the effect that your speech-act has on the hearer once he or she understands it. But the illocutionary act is a matter of communicating a message. There the illocutionary effect is one of understanding. So if you ask me "Is it raining?", and I say "Yes, it's raining", then the illocutionary effect is my just getting you to understand that I've said that it's raining. But the perlocutionary act would be things like producing in you the belief that it's raining, or getting you to carry an umbrella. So I think there is a clear, intuitive distinction between communicating, that's just getting your message across, and the further effects that it has. Now of course the whole point of communicating, typically, is to get further effects. We want to convince people of our point of view, we want to change their ways, we want to feel stable expectations because we've made a promise. But all the same you need a strict theoretical distinction – and in a way this was Austin's great contribution – between the speech-act proper and the further effects. Behaviorists always wanted to make it about producing behavioral effects in other people, and that's too crude a device, so I think there is a clear distinction.

JM: You went further and divided illocutionary acts into directives, commissives, assertives, expressives and declarations. And the idea is that the existence of those categories can't be an accident. It couldn't be the case that you found a language where they had totally different categories.

JS: That has to be somehow or other a consequence of the nature of the mind. If my theory of language is right, then those are the possibilities: you can't go and invent a totally new kind of speech act. Wittgenstein always tells us we can do this: just invent a new language game. But I used to ask my students to do it: "OK, go home and tomorrow bring back a new language game." And it turns out they're always variations on the old ones, as far as speech acts are concerned. Now the basis of the taxonomy is that there are only a finite number of ways that the mind can represent reality. It can represent it with the mind to world direction of fit, where you represent something as true or false, so "It's raining." Or you can represent it with the world to mind direction of fit, so when I tell you "Shut the door!", then I'm trying to get your behavior to change to match the mental or linguistic content. And then you get both directions of fit in

the case of a declaration, and a null direction of fit in the case of the expressives.

JM: Why do we bother to express ourselves if not to affect something in the world? Perhaps simply expressing how we feel is an invitation to someone to respond in some way...?

JS: It can't be.

JM: So what would be the point of a null illocutionary act?

JS: The point of the expressive is to express your feelings and attitudes about some state of affairs that you presuppose to exist already. So you apologize for doing something that you think is a bad thing to have done, or you thank somebody. And I think there are all kinds of points in having expressives, it just makes society work better, if you can express gratitude or express thanks or express regrets in the case of apologies, or express pleasure at somebody's good fortune...

JM: But that's appealing to society rather than to the mind. No doubt it contributes in that way, but why does it arise?

JS: Because we are the kinds of beasts we are. Why do I congratulate my friends when they've had some good luck? Because I feel good about it. And they feel good about my feeling good about it. And there's a name for that; that's called 'congratulations'. When I say "Gee, I'm glad you won the race", or whatever. So I think there are all kinds of reason for expressing our feelings and attitudes. It isn't just to get people to change their behavior. Maybe when you're seducing a woman you're trying to get her to change her behavior, you give all sorts of expressives. But there's a variety of reasons for performing expressives, and I don't think there is any simple motivation. It's just part of social relations that we have these feelings and attitudes and one way we relate to other people is to communicate them to them.

JM: But the whole point of communication is to exchange meaning, and you use the distinction between syntax and semantics to great effect. Syntax is the formal structure of language, and one would normally understand semantics as the part of language which allows us to understand what is going on, but in various places you introduce the concepts of the network and the background, concepts which some have thought of as unnecessary complications. Could you perhaps tell us what the background and the network are and how they contribute?

JS: OK, well those are good questions and I think they still need more work. There is a view that is now very widespread, I guess it comes from Wittgenstein and other people like that but it's sometimes called 'holism', and the idea is that you only understand a sentence in relation to other sentences. So you understand "Close the door!" only if you understand what it is for something to be a door, and that doors are things you put in openings between rooms in houses. And you have to understand what a house is, and what it is to pass from one room to another. So it looks like in order to understand any sentence, you can only understand it within a network of other sentences and words. But what goes for sentences goes for beliefs. In order to believe that the door is closed, you've got to have a whole lot of other beliefs. Now that I call the network. But now it turns out if you try to track down the threads in the network, if you think "OK let's not be lazy about this, let's write it all down", you find somehow you can't quite *do* it, because it goes on indefinitely. Each time you write a new sentence it turns out you've got more sentences that you need to explain that sentence.

Now what I'm giving you is not a formal deductive argument, but it's a plausibility argument, and it says look, it's best to think that this network trails off into a set of capacities that people just have. They know how to do things. They know what it is to walk into a room or open a door or sit down. Those capacities, I think, underlie our ability to interpret the semantic content in the network, and it's that set of capacities that I call the background. Now I think again that something like this is in Wittgenstein, I'm certainly not the first philosopher to say this. In fact if you look carefully, you'll find this in a bunch of philosophies. You'll find it in Hume, because Hume is always saying "Well we just have these habits, we just have dispositions to behave in this way."

JM: You're not averse to a bit of rhetoric occasionally, are you?

JS: Well, I think you have to communicate effectively. I don't think rhetoric is a substitute for logic but I think there's no point in saying something if people can't understand it or they can't see the force of the argument. Take this Chinese Room argument of mine; I think a lot of the effectiveness of that has to do with not just the abstract structure – that syntax isn't sufficient for semantics – but derives from the fact that here's a simple example that anybody can understand: you're locked in a room with a bunch of Chinese symbols on cards and you have a program which tells you how to give them back through a slot in the wall in response to other cards coming in, and all the same you don't understand Chinese. Now any kid can understand that.

JM: But in the context of the current interest in consciousness, the Chinese Room is possibly the best-known philosophical argument in the world today.

Take this Chinese Room argument of mine; I think a lot of the effectiveness of that has to do with not just the abstract structure – that syntax isn't sufficient for semantics – but derives from the fact that here's a simple example that anybody can understand: you're locked in a room with a bunch of Chinese symbols on cards and you have a program which tells you how to give them back through a slot in the wall in response to other cards coming in, and all the same you don't understand Chinese. Now any kid can understand that.

JS: Is it?

JM: I would say so, because not many philosophical arguments make the mainstream press. It's appeared on television; I know *Horizon* did a documentary on it. And it's very nice because it does bring together all those strands: language, consciousness, and even, in miniature, the social relationship because you have, what's going on inside the room and you have the real person outside. But the argument seems to have changed over time – assuming you still believe that it's not possible to have a mind by virtue of running a computer program. But are you restricting that to a particular program or algorithm or just anything that is executed by a formal mechanism of symbol manipulation?

JS: Well, I think that's a very good question. The basis of the argument is that the formal symbol manipulation of a computer program isn't sufficient to guarantee a mind. And the beauty of the example was I didn't have to consider consciousness, and secondly, I didn't have to ask the "How do you know?" question because I made it about my own case and it's obvious I don't know Chinese. But now then, the question is, well, what is meant by computation? And, of course, I use a standard textbook definition where computation is a matter of carrying out the steps in an algorithm. Now some people thought, well, how about algorithms for connectionism – connectionism is another word for parallel computing – but it's the same point.

JM: We could do that linearly. That doesn't really affect the argument at all.

JS: You're absolutely right. It's just most people don't get that point; I have to explain it to them. I mean, we know from the Church-Turing thesis that any computation you can do on a parallel machine, you can also do on a classical machine. So, the computa-

tional power of connectionism is not one whit better than a classical machine.

JM: But there are still some interesting issues which I'd like to take up. In the original example, you built upon Shank's work and then turned it into this exchange of symbols – the people on the outside were putting in 'questions' and out came 'answers'. The labeling of that process is entirely arbitrary. Suppose instead it turns out from speaking to an interpreter who spoke to the Chinese outside and they said, "I've been having a very nice conversation with whatever is in the room." What would that do to the argument – it would seem to suggest that in order for that to be possible, many other things would have had to be granted: the existence of a common background, some intentionality in order to have a meaningful conversation.

JS: Yeah but the point is, you see, they'd be mistaken. That is, they thought they were having a meaningful conversation but it turns out that their interlocutor, namely me, was treating all their questions as meaningless symbols. The person they appeared to be talking to didn't understand a word they said.

JM: That deals with the essential argument of the 'systems reply', which says that the symbol-manipulator doesn't understand anything but the system as a whole does. But how do you deal with the issues of different levels of description?

JS: The answer is very simple: why don't I understand Chinese? After all, I'm answering all the questions. And the answer is, because I have no way to know what any of those words mean. I just have the symbols. And it's no good saying, "Well, the system knows what they mean." Because the system's in the same situation I am. The system has no way to get from the syntax to the semantics either. It's just a bunch of meaningless symbols to me or the system. And I show that in the original publication by saying, "Internalize the system: let me be the whole system." I'll memorize the rules and get rid of the room and work outdoors. All the same: I still have only symbols. So the 'systems reply' is a desperate move which says the whole room understands. And the reason that it's a desperate move is: the room hasn't got anything that I don't have. See, the 'systems reply' says "you really do understand Chinese, you just don't know that you do."

JM: You said that the people outside, in believing that they're speaking to someone/something that understands, can be mistaken. But from the first person perspective understanding has a privileged position and it really only makes sense to say, *"I understand"* or *"I don't."* The *'I'* is making a first person statement which it has the privilege to do; an individual neuron or group of neurons in your brain can't respond with, "I know how to speak English," but John Searle can say, "I speak English, but not little bits of my brain."

JS: But, you see, the point is not that there are features of the system that aren't features of the elements. Of course that's true. But this is a specific feature, namely the ability to move from the syntax to the semantics; from the symbols to the meaning of the symbols. And in the room you haven't got any way to do that. I have no way of attaching any mental content to these symbols. And the point is: neither does the room. The room hasn't got any way to figure out what the symbols mean any more than I do. So the point that there can be system features that aren't features in individual elements is irrelevant to the argument. The argument is: the syntax – which defines the operation of the system – isn't sufficient to guarantee the presence of the semantics. And that's true for the individual element or for the whole system.

JM: That's a fair point because it brings together a number of things – I can't say I agree, of course, but...

JS: Why not? I think it's obvious – it's an obvious point.

JM: Well, there's also the issue of mind-body dualism and I think you've dealt with it in a unique way which is basically to say: wrong question.

JS: Yeah, get rid of all those old questions and just ask how the brain works. We know that it works – I mean, we don't know the details, but we're getting better at it; we're figuring out how it works.

JM: So what is, in a nutshell, the way of abolishing the distinction between mind and brain?

JS: In real life, the way you do it is this: The brain is made up of all these neurons and the individual neurons – you're absolutely right – don't have any semantics. But what happens is that neurons, through causal interactions – causal interactions, not just formal, symbolic interactions but actual causal relationships with actual neurons firing and synapses operating – cause a higher level feature of the system, namely, consciousness and intentionality. So, I am all in favour of the idea that there are different levels of description of the system because that's my way of solving the mind-body problem. That is, that you can have these causal relations among these meaningless elements at the lower level that produce meaning at the higher level. But that's a causal story, that's how it works as a piece of machinery.

JM: So do you think that one of the classic mistakes is to cross levels to create problems? In other words, to keep on trying to explain mental states in terms of lower-level phenomena and establishing a causal relationship which is meaningless?

JS: Well, I do, I agree with that. But I want to go to the next step and I want to say, it isn't just that they mix levels, but that they don't understand that the key to understanding nature is that it's a series of causal relations and the notion of computation is not a causal notion, it's an abstract syntactical or symbolic or formal notion. And that's one of the beauties of it. I mean, it's one of the great achievements of the 20th century that you can do so much with so little. In a funny kind of way, though a computer is a machine, computation isn't a machine process; unlike the running of an internal combustion engine, it doesn't involve the transfer of energy. Now here's the irony: the brain really is a machine and consciousness really is a machine process involving the transfer of energy in the brain, but computation is not in that way a machine process. Computation is an abstract, formal, mathematical, symbolic process that you can implement in a machine. But consciousness isn't just implemented in the brain, it's actually caused by the brain: it's an actual effect of the interaction of the neurons. So I want to say, you're absolutely right about levels but there's something more than levels: consciousness.

In a funny kind of way, though a computer is a machine, computation isn't a machine process; unlike the running of an internal combustion engine, it doesn't involve the transfer of energy. Now here's the irony: the brain really is a machine and consciousness really is a machine process...

JM: So could you explain that now in the case of the engine?

JS: Well, the point is this: if you want to know how the car engine works, there are different levels of description. There's one level of the alloys of the metal molecules and the oxidization of the hydrocarbons in the cylinder. But there's another level you talk about: of pistons and crankshafts and the explosion in the cylinder that puts pressure on the piston that turns the flywheel that powers the crankshaft. Now that is a higher level of description of the same system that has these lower level elements. And I want to say that analogous points can be made about the brain. But all this talk about systems in both the car engine and the brain only works because we understand the causal relations involved.

JM: So what was the overall intention behind *Mind, Language and Society*, apart from simply drawing together these things?

JS: What I tried to say in the introduction is, if you write a lot of books that look like they're on different topics, eventually, you'd like to write a book that

shows how it all hangs together. And this is that book. Now, I didn't put everything in it. My next book is about rationality and I had a chapter in this book on rationality, but my wife convinced me to leave it out because it overburdens it, I've got too much material already. But I do think that intellectual advance comes not when you make a series of little discoveries but when you get a comprehensive theory. And, basically, as a philosopher, I want a comprehensive account of how things work. We've got a pretty good account of physics – about how the physical world works – but we do not have a satisfactory account of the set of relations between mental states, language and social reality and that's what this book is about.

JM: You say philosophers shouldn't be too worried about it, but you did say many years back it was a shame that freedom of speech and civil rights were not 'sacred topics' – these are things which need to be defended. But this is very much a philosophical question, particularly when people have the freedom to be emotive, or to incite. Would you defend freedom of speech absolutely?

JS: The traditional defense of free speech in our culture, I think, is much too feeble. It comes from John Stuart Mill and it is essentially a utilitarian defense: that we're all better off and happier if there's freedom of speech. I think that's much too feeble. I think it's a basic human right and it's a basic human right precisely because we are speech act performing animals; it's like a right to move your body around. And so the question, "Why should we have free speech?" is not answered by saying, "Well, society is better off if we have free speech than if we don't have free speech." Because that means, in a situation where society isn't better off, it looks like we'd be justified in restricting free speech. I think, in fact, the justification for free speech has to do with us – and I should write something about this; I never have – but it has to do with us as speech act performing animals. It seems to me, it's a basic feature of us as biological human beings, as beasts of a certain kind, that we've got this capacity to talk. And I think a restriction of that is like a restriction of any other human capacity: it's a violation of a basic right.

JM: That's interesting, because you're taking that concept back to our fundamental nature whereas you've done a lot of work on the creation of a social reality. How does a social reality actually come about by virtue of our intentionality and our speech acts?

JS: Well, that was my book on the construction of social reality and I repeat a lot of that in *Mind, Language, and Society*. The basic idea is that there is this reality of money and property and marriage and government and cocktail parties and universities and television stations, and it, in some sense, exists only because we believe it exists; it exists because we accept it. And I argued in the book that you really need only three primitive notions in order to construct social reality: you need the notion of assigning a function to something; and you need collective intentionality – the capacity that people have to act cooperatively; and then, you need this peculiar notion which I call a status function, where something can perform a function only by virtue of the fact that it's recognized as having a certain status. That's true of money, and presidents of the United States, and language. And that's the key notion in the book. Then I went back and used this old notion of a constitutive rule – that something is counted as something else. So this piece of paper counts as money in our society. So that's the basic idea of the book and then I work it out in some detail.

JM: So, in the context of human rights, are there some rights which are based in social reality or are they all fundamental to our nature like that of free speech resulting from us being speech act animals?

JS: All rights are socially constructed. I mean, you don't discover a right the way you discover you've got a thumb. What you do is you discover that you have a certain nature and then you assign rights on the basis of facts like what sort of beings are we. So, in my terminology, our rights are observer-relative – a right only exists relative to the acceptance or assignment of that right. But that doesn't mean it's arbitrary and I think we can give a better justification for free speech than John Stuart Mill ever did.

JM: So what future projects do you have in mind?

JS: Oh God, well, if I could live long enough, I'd like to write a hundred books. Some of the stuff we've been talking about, I think, really, there ought to be more books. I think if we had a theory of social ontology and a theory of rationality, then we could maybe advance political philosophy in a direction that I think it ought to go: what I'm calling a political philosophy of the middle distance.

JM: Is the political philosophy of the middle distance, is that equivalent to – what shall we call it – the third way, which is, perhaps neither the right wing conservative style or the fully socialist?

JS: No, no it's not the third way. It's more like this: there are philosophical points to be made but we don't have a vocabulary or the categories or the intellectual resources even to state them. So, for example, some countries are just awful: Mexico, as a set of institutions, is just dreadful. The people are nice, the country is beautiful, but the institutional structure in Mexico is awful. Now, here's our problem: no politician can say that – well, okay, they can't say it for political reasons – but no political scientist can say it because it doesn't sound like science. And no philosopher can say it; all they can do is talk abstractly about, what...? Does it meet Rawlsian conditions of the veil of ignorance? But to actually talk about social, institutional reality in politically thick terms, we're not yet able to do that and we ought to have the vocabulary to do that.

The traditional defense of free speech in our culture, I think, is much too feeble. It comes from John Stuart Mill and it is essentially a utilitarian defense: that we're all better off and happier if there's freedom of speech. I think that's much too feeble. I think it's a basic human right and it's a basic human right precisely because we are speech act performing animals; it's like a right to move your body around.

JM: And how do we get the vocabulary into common use?

JS: Well, we don't worry about it. It either happens or it doesn't.

JM; Just create the tools and if they're useful, people will pick them up.

JS: Exactly.

JM: How would you feel then about the political and social role of the alternative vocabularies created by the political correctness movement?

JS: Well, I think they try to impose a more or less oppressive vocabulary on the rest of us. But it's not working. The use of the term 'political correctness' itself is a rejection of this oppressive total – 'totalitarian' is too strong – this authoritarian tendency.

JM: Orwellian Newspeak?

JS: That's right – trying to get us to have this sort of Orwellian avoidance of 'crimethink'. Newspeak I think is awful. But I think it may be going away.

Originally published on John Searle's site <socrates.berkeley.edu/~jsearle/articles.html>

Neo-Vorticism: The Tao of Form

Distilling the Real, Resituating Art, Rewinding the Formative Springs of Life

Martha Senger at the Aesthetic Phase Shift Lecture Series

by Martha Senger

The following is excerpted from a talk Martha Senger gave during the G2 Institute's lecture & event series, Aesthetic Phase Shift:

DURATION OF COMPLEXITY > AESTHETOGENESIS

We're in the midst of a momentous cultural shift perhaps equal to that of the emergence of consciousness several thousand years ago. The major tenets of western thought are falling and their dissolution documented by deconstructivists who have proclaimed the death of the subject, the death of reason, the end of history - and the death of art.

Gregory Bateson said *"what continues is form"* stressing that form was divorced from matter at the time of the great subject/object split of the 17th century and must be reconnected if the planet or our psyches are to survive. And since forms develop with the movement of spirit in history, we're charged with the task of discerning a new form, a structuring that will take us beyond our present confusion and dismemberment while resisting the imposition of another static order. Since quantum and chaos theory, we know that an immense whole is hovering close by in another dimension, but the question is, how do we connect with it?

I begin this reconnection via Bucky Fuller's synergetic geometry - a form that integrates matter with mind. The universe he describes is "convergently and divergently interaccommodative" with electromagnetic radiation being physical, expansive, and entropic, and gravity on the other hand being metaphysical, contractive and negentropic.

It's clear that what gets measured by the Dow Jones stock average and keeps us on a frantic chase from day to day is tied to expansion rather than contraction, and that material expansion is in fact the summum bonum of bourgeois existence and the world's economies, deriving its justification from exact science's anointing of an objective reality principle, although the public's subjective needs must continually be manipulated symbolically to avoid revolt.

What I suggest is that we must revolt against continued expansion if we're to begin to correct the expansion/contraction imbalance and halt the flow of entropy. This means instituting a movement toward contraction and convergence, connecting and synchronizing ourselves with the supergravitational force that's been found to underlie all the other forces, and appears to manifest psychically as imaginal, analogical reflection – as self-organization; as nonlinearity – and the negentropy of higher forms of knowledge and information.

Paul Davies places gravity's role within a cosmological perspective, writing in *The Cosmic Blueprint* that gravity is the fountainhead of cosmic order - responsible for organizing matter, and causing it to grow increasingly clumpy. Pointing out that where the laws of thermodynamics normally bring about the disintegration of structure, in gravitating systems the reverse happens: structures seem to grow with time. "Way back in the primeval phase of the universe," Davies writes, "gravity triggered a cascade of self-organizing processes that led, step by step, to the conscious individuals who now contemplate the history of the cosmos..."

He notes that spontaneous symmetry-breaking accompanies the appearance of new forms of order and that the history of the universe can be seen as a succession of symmetry breaks in which more structure and differentiation occurs with each step, freezing out a distinctive new quality. And that the universe as a whole is engaged in unidirectional change, an asymmetry symbolized by an imaginary 'arrow of time' from past to future.

For systems close to equilibrium, however - which means ours - fluctuations are suppressed but at the point of bifurcation, if they become amplified they can drive the system into a new phase which would then become stabilized. It is this amplification that's needed if we're to break the unstable symmetry of our present system and escape to a higher order.

Translating the clumpiness principle to the present, Paolo Soleri writes in *The Bridge Between Matter and Mind* that we must "move from the granular and scattered to the synthetic and clustered, from the unrelated and incoherent to the interconnected and coherent" if life is to evolve. To this end he proposes that architecture assume a new, radical scope - that it set up what he calls "hotbeds for the instauration of new physio-mental circumstances - thick ecologies that enlarge the personal universe of each individual by centering them in the thick of things" - thereby restoring us, he wrote, into a structural congruence with nature whose first demand is for leanness and substance, not opulence and fraud. He sees complexity as an increment of coordinated activities happening in contracting spaces - diametrically opposite to the present system that divides individuals into autonomous atoms to control them and insure maximum physical expansion of our 1-dimensional Flatland

Systems philosopher Erich Jantsch also called for such miniaturizing strategies - information technologies that would open "negentropy niches" for conscious evolution - a technology that would no longer only serve the steering of energy and production processes (our present mindless equilibrium structures) but instead serve to diversify our personal experience - creative processes would be permitted to unfold through the mediation & transformation of matter, allowing for the formation of new complex structures. In *The Self Organizing Universe*, he wrote: "Events are no longer connected in a sequential mode, but in an associative mode...The experienced processes of the past and the visions of an anticipated open evolution are directly grasped in a 4-dimensional present. A state is generated which resembles the cyclic concept of archaic cultures. Poetic reality breaks into the profane reality of everyday life."

THE LAWS OF FORM: CONDENSATION AND CANCELLATION

In *The Laws of Form*, G. Spencer-Brown developed a new formal logic or algebra in which he augmented Boolean algebra's three criteria for a valid argument beyond the true, false and meaningless to include the imaginary "The implications of this in the fields of logic, philosophy, mathematics, and even physics, are profound."

As art critic Suzi Gablik wrote in *Progress in Art:* "The tendency in both science and art towards more condensed, succinct and abstract formulae for describing the essence of reality, its skeletal structure, the ultimate to which it can be reduced...There is something stable within the flux that maintains historical continuity - an internal transformation which ascends to higher levels of complexity, revealing ever new comprehensive features, the study of which requires ever new powers of understanding...Each stage carries the seeds of the next phase, and each new cognitive structure includes elements of earlier structures but transforms them in such a way as to represent a more stable and extensive equilibrium."

In *The Collective Unconsious* Frederic Jameson points to the ghost of primitive communism that stands outside history, moving it unseen, waiting for an opportunity to break through its contradictions and emerge as the Totality it remembers being in an earlier time. Many others, including Ralph Abraham and Riane Eisler, have documented prehistorical societies where a partnership ethos prevailed before the onslaught of the dominator principle. By primitive communism, Jameson means a form of life or community in which the members thought as a totality, as a mystical body, before that relationship was "reified" by market forces and we shrunk into individual subjective units of consciousness within the world of

fetishes that have been substituted for our once symbolic connection with the world.

LIVING IN THE TRUTH

Such a movement from below surfaced just a few years ago in the Czech Republic led by artists inspired, as its leader Vaclav Havel said, by their desire to "live in the truth." Having overthrown authoritarian socialism they are now struggling to find a way to live out this vision within the constraints of capitalism.

The communities I'm part of - the Goodman Group and G2 Institute for Integral Aesthetics - suggest establishing enclaves of resistance; small experimental cells that reverse entropy through integrating functions torn apart by the system; reconnecting the circuits between the conscious and nonconscious, the individual and the group, and living and working - incorporating a spectrum of spaces - private, communal, and public access spaces to re-establish dialogical centers where we can rediscover shared meaning and unalienated work and move beyond the atomized subjectivities we've come to inhabit.

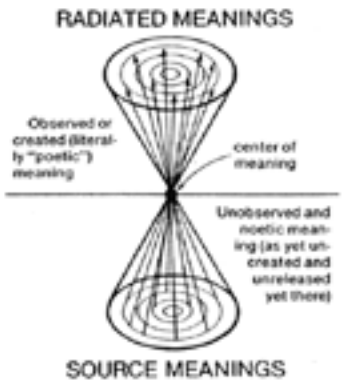
This is an integral form of life that existed before the Industrial Revolution that artists have continued to live during the modern era. What Artsdeco has done at the Goodman2 building is fold in more complex functioning within a compact spatial structure and made it all self-managing with the goal of creating a thick ecology – an ecology of meaning. I call it 'chaos architecture' in that it creates open ended opportunities for shared living, working, and imagining now blocked by the system.

I see this as a broader aesthetic practice than the production of discrete art works. This doesn't mean that individual art works won't continue. Of course they should and will. It simply means that new nonlinear science has added its mathematical findings to artist's intuitive sense of how the world works - creating a grand unified theory never known before that unites science with aesthetics - opening the door to reconnecting form with life. And potentially inaugurating a new avant-garde practice just when the critics have decided that avant-garde is dead.

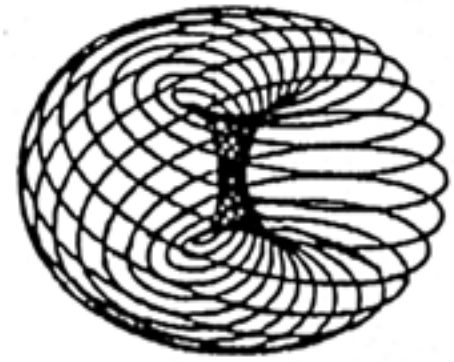
ECONOMIMESIS: THE IRRUPTION OF THE SUBLIME

Such a praxis, based on a shared ideal of beauty and wholeness, mimes the very movement whereby spirit seeks its most adequate form during the course of history. Derrida calls this autoproduction of meaning "economimesis." I add it's also *a least entropy material praxis* that dematerializes mass as it distills the universal from the particular - a praxis that moves fractally toward a reunion with unity in a synchronistic concatenation between the poetic word and the random in phase space.

Thus we supercede not only 3D space but space-time as well to enter the primordial time of the imagination. Charles Muses, the mathematician and mystic, developed a theory that resonates with this practice that he called "chronotopology" - a nonphysical topology of symbolic resonance in time based on the movement of negative, imaginary numbers.



This illustration from Charles Muses' book *Destiny and Control in Human Systems* shows how poetic meaning radiates from a higher-dimensional source through symbolic insight. As Dr. Muses wrote, "Time is not intrinsically consecutive but rather of radial nature, manifesting through apparent cycles but actually radiating through the ever-present moment and recalling us ineluctably to re-contact our origins, in a prodigious and profound context of what memory means." In an interview, he added, "The object is to surf on time, a non-spatial dance in which we come around a little differently, as on a spiral."



Just a couple of months before he passed, I asked Dr. Muses if he could give me an image of the torus that expressed his chronotopological perspective. He sent me this image, stressing that he preferred to call it an *umbilicord,* which is a torus with an infinitely small hole. I think it resonates with the rhythms of the symbolic unfolding he described. In fact, Dr. Muses looked to a future science that would be at one with depth psychology—in his words, "A science of resonances and of time pulsations"—but wrote that in order for this to occur, we'd have to re-achieve an earlier state of symbiosis that was lost when humans, in their hubris, turned predatory. Which in turn would require a fractional distillation of our present way of life.

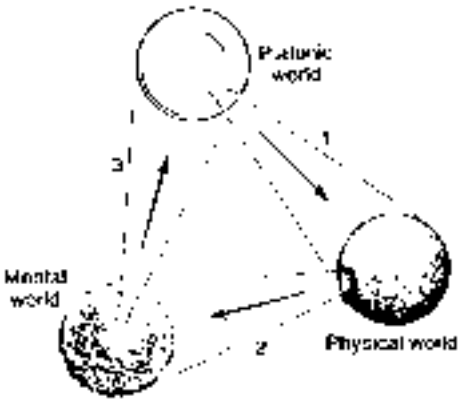
ROGER PENROSE'S TWISTOR GEOMETRY

The torus/umbilicoid seems very like physicist Roger Penrose's complex twistor structure geometry that unites quantum theory with relativity - which also has a vortex topology and shows its evolutionary arrow in time.

I've used this image to serve as a hieroglyphic sign of the higher dimensional process-state the G2 Institute describes.

Note its form is quite like the mushroom shaped monoprint I made in the late sixties which I called "cross-section of how" – which says a lot about the close connection between our imaginations and the forms of nature!

And as we've seen, it's a state that's structured by discourse - not the didactic discourse of fixed meaning that the western world has stood on for millenia to rule the world, but a flowing structure of evolving meaning – a transcendental structure that's progressively unfolded from the symbolic images given through our aesthetic perception of the cosmos – whose mathematical & geometrical structures turn out to perfectly match the feeling structures of our collective unconscious.

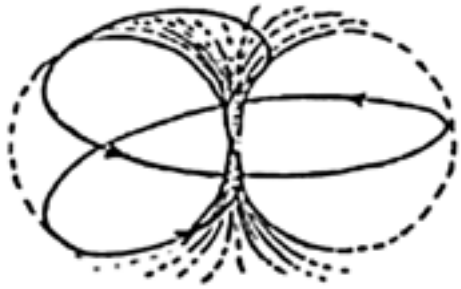


In *Shadows of the Mind: A Search for the Missing Science of Consciousness,* Penrose posits three worlds - the physical, the mental, and the Platonic world of mathematical, ideal forms. Explaining that twistor theory is fundamentally based on complex, imaginary numbers and their related geometry, he speculates that consciousness might have its origin in this third world:

"To me the world of perfect forms is primary (as was Plato's own belief) - its existence being almost a logical necessity - and both the other two worlds are its shadows."

Penrose also argues that these forms are not computable but accessible only via aesthetic feeling and understanding. He also suggests that quantum reality is described by two state vectors "one of which propagates forwards in time...in the normal way, and the other propagates backwards in time...This second state vector behaves 'teleologically' in the sense that it is governed by what is going to happen to it in the future, rather than what happened to it in the past...."

The late philosopher and inventor Arthur Young also proposed a geometry of meaning he based on the topology of the torus, a vortex sphere that like Fuller's 'rubber-donut jitterbug' expands and contracts. In *The Reflexive Universe* Young wrote: "We may think of the vortex as a fountain that is both jetting upward and rotating. In addition, the drops are gathered back toward center as they fall, and again sweep up and out. This implies that this figure reaches out and then tucks itself back in a cumulative cycling that contrasts sharply with the purely dissipative action of an exploding sphere. Or, this is a sphere that expands and contracts, the contraction accumulating the proceeds of the explosion."



VORTICISM>>>NEO-VORTICISM

Which is what I believe we're called to do now - fall into synch with the gravitational contractions of the cosmos and sculpt a new reality – cutting away all that's aesthetically extraneous while condensing all that's been and is yet to be learned guided by the synthesizing genius of our collective imagination – our shared sense of beauty.

This situates us within the domain of the 'strange attractor' – living time-free within a toroidal topology of uncertainty but with a clear view to the future – alert to its symbolic nuances, surfing its self-similar curves and tuned to the golden-mean ratio of that aesthetic object of desire at this epoch's end – the Singularity.

I call this praxis Neo-Vorticism in acknowledgement of an art movement in England in the twenties called Vorticism whose spherically explosive dynamics Neo-Vorticism deconstructs by connecting the abstracting formative process of the aesthetic imagination with the metadynamics of the torus – the etherealizing cosmic helix now unfolding in our midst.

ALGORITHMIC COMPRESSIBILITY RIDES AGAIN

This is the amusing title given to a section heading in *Theories of Everything* by John D. Barrow, an astronomer at the University of Sussex. It's a brilliant and witty book and most of its theories are over my head. But the notion of "algorithmic compressibility" rang a bell and as I read about it, it more and more seemed to describe what's been otherwise called recursion, bootstrapping and fractal nesting, resonating with how thought moves when it's on a roll and turning in on itself in a pleasingly patterned, unobstructed way.

This paper is an example of it. In his book *Godel, Escher, Bach,* Douglas Hofstadter describes it as "making variations on a theme" showing it to be the recursive, self-similar process shared by all three – Godel's incompleteness theory, Escher's spiral, aperspectival drawings, and Bach's fugues, which all gather and condense as they go along, ad infinitum. As indeed does the logic of form that G. Spencer-Brown wrote about.

This is the eterealization continuum Paolo Soleri built Arcosanto to set in motion, and that I and others found ourselves engaged in at the Goodman Building and during Artsdeco's development of G2. And that many of you have experienced in peak times when ideas and events synchronize "on a roll."

Everyone I've written about has uncovered a version of this new nonlinear reality which harmonizes and nests notions that appear incompatible in 3d spacetime within a golden mean, fractal unfolding of unity - an elegant self-organizing process caused, as Paul Davies writes in *Superforce,* by supergravity, - a superforce that provides "a framework for total unification, in which the entire world is placed under the control of a single masterforce—which displays itself through different facets – but all connected through supersymmetry."

This higher order symmetry would explain what philosopher Jean Gebser called the integrality of the fourth dimension, Arthur Young's "twofold order," Charles Muses' "time-surfing" and what Geoffrey Chew sees as nature's tendency to bootstrap itself through the sheer consistency of its interrelations. And it also jibes with Michio Kaku's suggestion that the laws of nature simplify when *self-consistently* expressed in higher dimensions.

Douglas Hofstadter describes the indirect self-referential patterns that Godel, Escher and Bach share as a "Strange Loopiness" – a logic that turns in upon itself, infinitely, in what he calls an "Endlessly Rising Canon." Playing on the title of the famous canon composed by Bach for the king of Prussia, RICERCAR, an italian word meaning "seek" – Hofstadter reinscribes it to stand for *"Reentering Introduction Creates Endlessly Rising Canon."*

THE FATE OF ART

At the beginning of this essay, I located the onset of modernity in the dualistic rationality that was authorized by the fathers of the European Enlightment – a mode of reason that split the sensible from the intelligible, aisthesis from noesis, and turned the body and the world into objects to be controlled.

In *The Fate of Art,* J. M. Bernstein dates this separation back to Plato, who first declared reason to be the only trustworthy route to Truth, Goodness and Beauty – ideal geometrical forms he believed occupied a static metaphysical realm unconnected to the world of flux and feeling. Poets, who came from their feelings and senses, were thus deemed incapable of direct access to the verities and only able to make copies of them – a process Plato called *mimesis*. What was worse, because of their adherence to sense and feelings, he declared poets to be a danger to the Republic and expelled them, and in so doing also expelled the polis – the world of sensuous, fluxing life – as a mode of knowing the real!

Here, Bernstein states, modernity originated in a form of reason that for two millenia has not only enforced the alienation of poetry and art from truth, but severed the archaic connections between body, mind, and world. This is the immense alienation that must now be sublated.

But the split won't be healed, Bernstein argues, *until art reclaims its unique power to cognize and embody not only beauty but also the good and the true*. And this can only happen, Bernstein and I both contend, by *desubjectiviing* art and *resituating* it where it was in early Greece, in *the body politic*. This is the arena & activity that was demoted by Plato from its mythic pre-Socratic status to what he called the realm of practice - a realm

he deemed ontologically inferior to the realm of theory and contemplation where he believed truth to reside.

"BEHOLD THE FORM AND ENTER INTO IT": THEN & NOW

Plato also wrote "Behold the form and enter into it." Though deeply dualistic in its exclusion of the senses, his idea of a metaphysical realm of the good that could be accessed through beauty continued as an inspiring ideal throughout the middle ages until Descartes and his fellow mechanists declared that matter and mind were radically different kinds of subtance and that "res cogitans" could never know or relate to "res extensa" except through an objective measurement of its dead, spatialized grid.

The redemptive and liberatory news from postmodern science, as we've learned, is that mind and matter are not opposed but rather complementary aspects of a deeper and integral reality that appears separated only because of our perceptual blocks.

STRUCTURING-AS-YOU-GO: THE GEOMETRY OF BECOMING

It's this vectorial "inside-out-and-around" *topological relatedness* that Fuller added to Platonic geometry that brings it to life and counters the flow of entropy in an omnisymmetrical "structuring-as-you-go." As Fuller states, *"The Principle of Synergetic Advantage requires that we proceed from macro to micro"* – and more simply – *"it is dealing with the whole that makes it possible to discover the parts."* As mentioned above, this has its topological/geometrical origin in a non-Platonic structure that Fuller identified as the Vector-Equilibrium – a "non-place" within the sphere's nucleus he described as follows: *"The vector equilibrium is the central symmetry through which both balanced and unbalanced asymmetries pulsatingly and complexedly intercompensate and synchronize."*

This is a topological geometry of *internal relations* like Arthur Young's torus, Charles Muses 'chronotopology' and the topological mathematics of chaos; a living geometry that reconnects the realm of the body and senses with the collective overmind of the species via a five-dimensional, fractally evolving image of the whole. Thus we finally have a geometry that's no longer restricted to static transcendent Being, but one that's opened to its ever-present origining – a geometry of Becoming.

It's taken two thousand years of stumbling over and working through these deep contradictions to bring us to this moment when we can actually move beyond the contradictions of history and begin it again at an infinitely higher and stabler realization of the mythological pre-Socratic unity. Such a categorical synthesis of the true, the good, and the beautiful – and the specialized spheres of practice that emerged from them in the form of science, the law, and art – would not only hugely reduce the entropic disorder that's bound up in their false and wasteful separation, but open the way to that reunion of the intellect and the senses that can liberate and resacralize life.

In deconstructing what's aesthetically irrelevant and untrue in the modernist separation of spheres, art can once again come into its highest destining – of bringing life into sublime synch with the rhythms and proportions of the divine Idea in its unfolding. It's where performance art has been leading – to performing the teleological drama in full cognizance of the quantum wave function as the choreographer of our symbiotic roles in the theater of the world. As artist Joseph Beuys predicted, *"In the future art will be anthropologically expanded as a social sculpture, created by many people."*

A HIGHER ABSTRACTION > AN AESTHETIC PHASE SHIFT

Michio Kaku informed us that the universe originated in ten (or more) dimensions that soon collapsed into the familiar four we've come to believe are all there is, while the remaining dimensions curled up into a compacted "Space K."

Now he tells us the four-dimensional world is collapsing as the higher dimensions are unfurling and drawing us into their compacted curvilinear configurations – an abstracting process he relates to beauty!

This shift resonates with Gablik's insight about art's movement toward the discovery of the skeletal structure of reality and her admonition that we'll need a "new cognitive structure" and new powers of understanding if we're to achieve "a more stable and extensive equilibrium."

Bringing such a new understanding into focus has been my goal. And as we've seen, it's an aesthetic form of cognition - an amalgamation of the senses and the understanding in the transcendental imagination that in its formative and synthetic movement unfolds in rhythmic synch with the pulsating waves of time as – in Charles Muses' words – "they break on the shores of reality."

This leap of perception will open the long-obscured pathway back to our archaic origins when we once moved in dreamtime-synch with the cosmos, but *naively*, to the aesthetically coherent state ahead when we will again but in the newly gained *gnosis* of its fractal-poetic path – of how it's done.

However, if we continue on our present path, we're destined to devolve as the entropy – the disorder – of our mechanized thought and behavior pull us ever deeper into a cultural Dark Age.

As Doris Lessing warned – "There are only two choices: that we force ourselves into the effort of imagination necessary to become what we are capable of being; or that we… blow ourselves up."

CALL FOR PROJECTS - Deadline 20 Oct. 2006

STRP is looking for projects, installations, or proposals that concern themselves with interactive art, robotics and/or Live Cinema (in the live cinema category we are looking for projects that rely on both performance and technology in order to become an audio-visual whole). All of the above in a context in which the artistic side is furthered by technology. This year we will also be paying special attention to projects, which involve light in their concept, composition, and/or execution.
The application forms are available in
PDF format - <http://downloads.strp.nl/strp-call06.pdf>
RTF format - <http://downloads.strp.nl/strp-call06.rtf>
To find out more about the 2006 edition of the festival, including a full line-up, press-releases and photographs please take a look at <www.strp.nl>.
If you have further questions please contact us at projects@strp.nl

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your annual membeship includes:

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Journals: The bimonthly YLEM Journal contains articles on a wide variety of topics and includes news of members and YLEM activities.

Forums: YLEM presents bi-monthly forums held at leading gallery and lecture spaces in the San Francisco Bay Area.

Website: The YLEM website includes a link to member websites, and can also host a member's website.

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An international organization of artists, scientists, authors, curators, educators, and art enthusiasts who explore the intersection of the arts and sciences. Science and technology are driving forces in the contemporary culture. YLEM members strive to bring the humanizing and unifying forces of art to this arena. YLEM members work in new art media such as Computers, Kinetic Sculpture, Interactive Multimedia, Robotics, 3-D Media, Film, and Video.

YLEM

Artists Using Science and Technology

Journal

pronounced eye - lem, 1. Greek: for the exploding mass from which the universe emerged - the material of the universe prior to creation

YLEM is an international organisation of artists, scientists, authors, curators, educators, and art enthusiasts who explore the nexus of the arts and sciences & technology. Science and technology are driving forces in the contemporary culture and YLEM members strive to bring the huma nising and unifying forces of art to this arena. YLEM members work in contemporary media such as Computer Based Art, Kinetic Sculpture, Interactive Multimedia, Robotics, Electronic Music, 3-D Media, Film, and Video.

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